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August 7, 1930

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Engineering News-Record

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Beginning

Construction Practices on New York's Third Subway System

First of a series of articles describing methods, materials and machines developed in over a quarter-century of subway building and now employed in constructing a line costing $12,000,000 a mile

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, AUGUST 7, 1930 Number 6

An Engineering Fault

CENSURE is about equally divided between engineers and contractors in the report published in this issue of the three engineers employed to determine the causes and blame for the Southfield Ave. sewer failure in Detroit. This decision does not carry conviction of justice. Undoubtedly the contractors did poor work, but just as certainly the faults assigned to them are exactly those that engineering supervision is expected to prevent by competent inspection. That the public works department of Detroit has an organization that makes inspection semi-independent and self-governing, shifts in some degree the personal blame, but it in no measure removes a disastrous piece of sewer construction from the accusation of faulty engineering. No fact brought out in the report indicates ground conditions or construction difficulties not entirely within the control of recognized construction practices. These, plainly, were not undertaken by the contractors nor demanded by the engineers; instead work was performed and permitted which in almost every essential quality fell short of the standards of ordinary good construction. In calling for a reorganization of the Detroit public works engineering department the report presents a decision which deserves far more heed than does its arbitrary division of blame between engineers and contractors for the specific failure investigated.

Obstructionist Tactics

NOW that a first overt act has been initiated by Arizona against the progress of the Boulder Canyon project, in the shape of a protest against expenditure of construction money to be appropriated by Congress, it is apparent that the aim of the state officials is obstruction and not any safeguarding of Arizona's rights. Such rights as the state may claim will be properly tried and adequately protected by future action in the supreme court, long threatened but not yet initiated. Attempts in the meantime to induce federal officials to delay progress on the work are purely mischievous. They tend further to alienate public sympathy from the Arizona claims.

Contractors' Licensing Experience

LEGISLATURES have rarely been willing to enact contractors' license laws which are as drastic as their advocates demanded or as has been found necessary after experience in their operation. It is not unexpected, therefore, that after about a year's operation of the California contractors' license law the official who has had the task of its administation is calling for changes. One is to extend the requirement for licensing by decreasing from $200 to $50 the amount of the contract that can be undertaken without a license. This change is tantamount to eliminating all unlicensed contracting. Another suggested change signifies more, however: to the effect that the contractor, in his application for license or renewal, shall name five persons as references, two of whom can testify to his credit standing and three to his past performance. In short, experience has indicated that some test of qualification is desirable. There is cheer in this conclusion, even though the test proposed is comparatively easy to satisfy. It may be recalled at this time that the license law originally drafted provided for prequalification by examination, but the California solons refused to approve a provision so drastic. The substitute of five references now asked, though far from satisfying the original demand for qualification, is an approach to that purpose. Perhaps it will prove to be the forerunner of a real measure of qualification. The citizen who accepts his state's certification of a legal contractor has a right to expect that it guards him in some measure against error in choosing his builder.

Less Subway Noise

IF THE reported study of the Chicago rapid-transit engineers to minimize noise in their subways is carried on with purpose, it will bring an advance of noteworthy magnitude. Railway-train roar and clatter is intensified to the highest degree in the closed, echoing spaces of a subway, and because it affects thousands of millions daily it has also the widest effect. Noise is now recognized as a serious attack on human efficiency and well-being, and numerous movements against it have been begun—weakly and as yet ineffectively. With the encouraging example of a determined attack on subway noise, all these movements will be strengthened. Even without this influence, a serious study of the problem of reducing subway noise is a matter for general congratulation. It holds out the promise that in time we may no longer have to travel, live and work under boiler-shop conditions.

An Underground Mystery

ONE OF THE interesting points involved in Chicago's subway work is the alleged corrosive effect of certain underground waters in that city upon concrete. This corrosive effect, according to some rumors, is back of an extensive piece of building repair work which for unknown reasons has been shrouded in deep mystery. The deep concrete foundation piers under a large business building have been almost all repaired or in part replaced during the last few years, because the pier concrete was found to be bad; but while opposing claims are heard, on the one hand that the concrete was originally bad, on the other that it was originally good but later disintegrated by chemical action, no proof has been

offered that there exists any such abnormal chemical effect as would penetrate several feet into a solid pier shaft. In the meantime, the old Jackson freight tunnel system with its concrete lining has steadily given satisfactory service. Further, construction practice in Chicago has continued to make use of concrete in underground exposure quite freely, an indication that men familiar with local conditions do not fear the redoubtable corrosion. If the new subway structure is built largely of concrete, as may logically be expected, the fact will further lay the ghost of the corrosion charges.

The Night-Rider's Car

ENGINEER or layman, the night-rider by rail sometimes asks himself whether the sleeping-car has reached the peak of possible perfection. Among the several items of transportation equipment it is the prime object of grumblings and protests. Electrician and decorator may do their best, yet the passenger often reflects that palatial surroundings and period furnishings do not compensate for positive discomfort.

Today, or tonight, the average night-rider disrobes under difficulties behind a curtain, in a low-ceilinged cell, and then sleeps—or at least spends the night—cribbed, cabined and confined in this more or less comfortable and usually less ventilated dungeon. If he essays an upper berth he may have some realization of the horrors of the middle passage in the 'tween decks of the slaver's low and rakish looking craft. Next morning he clothes himself with the aid of acrobatic contortions and then proceeds to a common washroom which frequently doubles as a smoking room and is as frequently malodorous. There he performs his ablutions and completes his toilet in company with several other inmates, all getting in one another's way.

When dressed and presentable, he returns to his cell to find that it has not yet been made up for the day, especially if the upper berth is occupied. Shall he intrude into a berth that is made up? He may, if there is one and if its possessor looks agreeable. Or he may sit in the smoking room and study the manners and costumes displayed by the toilet performances of the later risers. On luxury trains he may go to a lounge car, with less satisfaction than if he were occupying his own place with his property at hand. And if he arrives at destination in the early morning hours, the usual thing, it is likely that his berth may not be made up at all, so that in somewhat disheveled condition he gathers together his baggage and papers as best he can before alighting.

Sleeping-car improvement appears to have been given into exclusive charge of the interior decorator, judging from descriptive articles and advertisements. Estimable passenger agents call attention to trim and furnishings, to modern berth lights, fixed partitions, mouth-wash faucets, razor-blade boxes and other accessories; but these things do not bear on privacy, comfort or decency. Other agents expatiate upon the compartment car—a rare convenience, for which an absurdly high extra charge is made. For the vast majority of night-riders the sleeping car means the open-section curtained device that has survived for many decades. Except for the time, some years ago, when a genius in a burst of inventive inspiration found a way to lengthen the berths by the few inches necessary to accommodate human beings of average prone length, it has remained the same as in its earliest days, the trimmings alone modified. Now, in the modern era, when human efficiency has a proper valuation, it is in order that the sleeping-car be brought into harmony with men's real needs.

If the sleeping-car builder has fallen short, there is ground for complaint against the operator also. He succeeds in aggravating the inherent discomforts of the vehicle by his time schedules, which deprive the passenger of adequate sleep allowance. The typical overnight run is most craftily arranged to bring the train to its destination by 7 or 7:30; and in order that the prompt exit of its passengers may be assured arrangements are made (or claimed to have been made) to move the sleeping-cars to a storage yard soon after, so that the passengers are peremptorily called up at 6:30 or 7. Having, the night before, with difficulty managed to fall asleep some time after midnight despite the discouragements of noise, lights and corridor traffic, the night-rider rises dull and unrefreshed, and goes forth to his day's work with unpleasant memories of his stay in the traveling hotel.

These conditions are with us today. How long will they endure? Is it possible that the engineer will some day add to the marvels he has accomplished in perfecting the steam turbine and the automobile, in building airships, subaqueous tunnels and radio sets, by developing a sleeping-car that will permit of sleep, comfort and decency? If he can, and further can regulate its operation so that a tired traveler may find it a rest sufficient to fit him for the coming day, it will be another achievement for the book. The trend of progress at present is not encouraging. But, confirmed optimists as we are, we firmly believe that the sleeping-car too has a future.

Whither Are We Heading?

A SERVICE mortality record that casts black reproach on our vaunted organizational powers marks the history of state highway administration during the last half dozen years or more. Dismissal of the state highway engineer of Louisiana adds another disorganizing change to a long list. It is true that this one occurred under an administration where despotic arbitrariness is the normal order of things. But regardless of the special state of affairs in Louisiana, we face the broad fact that less than a dozen of the 48 states have today the same chief highway engineers who were in office five years ago. If such is the situation, one may well ask, Whither are we heading in our highway work?

Large stakes are involved. A pregnant illustration is the fact that Texas, just involved in a state primary election, had as one of its chief campaign questions a project for a $300,000,000 road bond issue. A year ago the smaller states of South Carolina and Iowa began on bond programs of $60,000,000 and $100,000,000, and similar sums are involved elsewhere. Each year a billion dollars is being spent by the states as a whole on road construction—on the average, $20,000,000 per state. The efficiency with which these vast sums are applied is a prime issue in the matter of highway department stability.

It was not inefficiency or negligence that brought about the dismissal of so many able highway executives, for with the exception perhaps of a few individual cases they were men of widely acknowledged skill and probity. Political considerations alone are the motive of the frequent upsetting of competent organizations. This means the introduction of a spoils system, open or thinly disguised, into highway administration; and a spoils system

can do no other than defraud the public and waste its substance. No private business could succeed, or could avoid huge losses, under executive policies so destructive of all service values as those followed in state highway administration. Is any better result to be expected in the work of the state?

New York Subway Engineering Progress

IMPROVEMENT in construction methods and magnitude of construction expenditures establish the building of New York City's third system of rapid-transit subways as a work of the first order in engineering interest. A series of articles summarizing these developments is begun in this issue; with two-thirds of the construction completed, practices have been established and can be appraised.

As planned to be carried out in two steps, the third subway system is estimated to cost $1,250,000,000. Expenditure has passed the meridian point on the first step; of the $650,000,000 which the work is estimated to cost, more than $400,000,000 is pledged by contracts awarded. Adding the estimated total cost of the third subway system to the $522,000,000 which was the cost of the first and second systems, the cost of completed and projected municipal subways in New York City amounts to $1,772,000,000. Even this astounding total does not include interest during construction, legal expenses and administration, nor does it include virtually a hundred miles of company-owned lines in the cost of which the city has participated.

The little over a hundred million dollars paid for the first 25 miles of subway in New York was regarded as a staggering expenditure. Fivefold expenditures are being undertaken for the present subways. The original system cost a little over $4,000,000 a mile; the present system will cost nearly $12,000,000 a mile. So the scale increases; not only is all work costing more but more costly work must constantly be undertaken.

Aside from increased cost, the third subway system presents a very remarkable persistence of structural design. The subway structure of 1930 is like that of 1900. The principle of shallow subways and of subways with unconfined traffic lanes persists after 30 years. Both structure and principle have justified themselves. In 30 years there has been no structural failure of the steel bent and concrete jack arch structure adopted for the first subway. Nor has there been individual loss of integrity of steel or concrete waterproofing structure in a quarter of a century of service.

The economic reasons for the shallow subway hold as firmly today as they did when the first subways were planned. Despite the greater number of street services and the more exacting requirements for their maintenance, deep subway construction with frequent and large excavations for stations presents an economic obstacle which can still reasonably be held to be far greater than that of maintaining street services. Under New York ground conditions the shallow box type of subway has demonstrated its entire serviceability.

Improvements in construction methods, it should be recognized also, have intervened to preserve shallow construction. Staging methods have been designed which completely maintain street surface and services and give free working space for constructing subway structure. Equipment has been developed which can operate under the staging and apply power to virtually all construction operations. These advances in methods have made subway construction in open cut one of the most certain processes of modern engineering.

There remains a wide field for development in street staging and construction equipment. Experimentation has naturally been the order in the first application of these construction devices. A survey of scores of contract operations discloses all degrees of efficiency and economy of practice. These loose ends have to be tied up as future work is undertaken. The principle of open-span street decking and of machine construction in operations previously considered as unadapted to modern machine construction processes has, however, been established.

In reviewing subway construction practice as it has been developed in New York, the fact is forcibly presented that it fits a local situation particularly. For great mileages of the work existing ground conditions could hardly be improved. Drainage is not a problem, and generally stable earth and rock make side support of cut and the underpinning of buildings simple processes. Truly enough, there are in places deep soil and water and underpinning conditions which offer all the problems that ingenuity has been able to master; they are rare, however, when measured by aggregate mileage. Translating New York subway practice to other cities is therefore by no means an obviously sound possibility. But the city may be proud of its engineering talent that has devised a system of subway construction that owes little obligation to precedent and has failed in no structural manner to serve its purpose.

The Grief Book

MANY engineering offices maintain a file or book for recording special difficulties arising on any job. In preparing specifications for a new job similar to one already built it is customary in one office to bring out the trouble or "grief" book, and by its help to work out a better or simpler detail or substitute a new design. Sometimes a full office conference is held and the brains of the combined staff are focused on the problem which the incident has brought to the front. The value of such a method of recording difficulties and their handling is especially apparent in case of personnel which changes from year to year.

Sometimes a grief book leads to the production of a manual of procedure and action with reference to many things aside from pure engineering. Government staffs like that of the U. S. Coast and Geodetic Survey have many such manuals continually being revised. Special Publication 140 on Frst Order Leveling is a good example. How to handle a definite difficult recurring political situation is quite as important as how to correct a faulty design. Failure to deal with the proper officials may cause as much irritation as building manholes whose tops do not remain level with the pavement, or letting crosswalks abut against the curb so that curb breakage results—the latter one of the commonest and worst sins in the municipal engineer's catalog.

Grief books in some form have been kept for years. So long as there is room for improvement, whether in human relations or in engineering details, such recording of troubles and their disposal should continue. Some lesson can be learned from each entry; and conscientious study of the record would soon do away with a world of paste-pot specifications.

New York Subway Construction—I

Major Construction Problems and Developments in New York's Latest Subways

Virtually New Subway-Construction Practices Employing Recent Construction Inventions and Equipment Have Been Developed to Meet Changed Requirements of Street Maintenance

IN THIRTY YEARS of almost continuous subway building in New York City great changes have taken place in the requirements imposed on construction by the business of city streets. Because of the new problems there has developed a virtually new subway-construction procedure employing the new inventions in construction and the new materials and machines for construction. This article presents without detail the broad characteristics of subway structure, the construction developments, the construction problems and the contract requirements for the third subway system now under construction. Succeeding articles will summarize practices in open-cut timbering, excavation and underpinning and tunneling practices in earth and rock—construction practices which are destined to be used soon in other cities than New York. —EDITOR.

NEW YORK CITY'S third subway system is now more than 60 per cent completed. It is one of the great construction undertakings of the world both in cost and in engineering difficulties. The construction and equipment cost of the 55 miles of line will be $650,000,000. The Panama Canal cost $372,000,000 a quarter of a century ago; probably its reproduction at present prices would cost over rather than under $700,000,000. Turning to current works, the present Mississippi flood-control project carries an allotment of $325,000,000, and the Boulder Dam project is estimated to cost $165,000,000. A speculative estimate by U. S. Army engineers of the cost of the Nicaragua Canal now being surveyed is "over $1,000,000,000." These are enormous expenditures for single engineering projects, and among them the cost of the third subway system for New York City ranks high.

What are the structures and the construction conditions which entail a cost of $12,000,000 an average mile for 55 miles of rapid-transit underground railway largely on right-of-way owned by the city? What are the developments in subway structures and construction which so modern and costly a work presents? Answers to these questions are of importance because they express the state of the art of city underground railway construction and because the problems and methods involved are instructive to engineers engaged in a wide variety of work.

Briefly the answer lies in the construction problems and processes and not in the dimensions and intricacy of the structures created. It is presented in summarized detail in this article and others which will follow. These articles are based on personal observation of the construction of the two previous subway systems and on a detailed survey of the new line.

Routes and Structures

The third New York subway is an interborough system; its lines penetrate four of the five boroughs, as shown by the route map, Fig. 1. All lines are located under city streets except in a few places, and the streets vary in all degrees in traffic volume, character of buildings and number and kind of subsurface structures. The subway structure includes steel-bent-and-concrete-box in open cut, tunnel in rock, tunnel in earth on land, and subaqueous tunnel. None of these types of structure is new in New York City subway work; all were employed in the second system (1914-18), and all but tunnel in earth in the first system (1900-04).

Virtually the design of each type of present subway structure is the same as was employed for the corresponding type in the older subways. The box inclosure of steel bents with walls and roof of concrete jack arches is essentially the same structure as was employed for open-cut construction 30 years ago. Changes in clearances, in steel sections and in details have been introduced, but general structure has not changed in three decades of subway building. In general the same statement is true of tunnel structure.

Open-Cut Subway Structure—The structure in open cut consists of transverse steel bents every 5 ft. with columns in the wall lines and between tracks. The columns stand on concrete footings, and concrete jack arches fill between the wall columns and roof beams. There is no other longitudinal bracing in straightway line, but at stations and where other special structures are required the bent construction and bracing are specialized to meet the conditions. In soft or wet ground a beam-and-concrete invert is used; in rock bottom a 4-in. concrete floor is built. Usually the roof concrete is covered with a membrane waterproofing, and in wet ground this may be carried down the sides and across the bottom. All waterproofing is protected by 4 in. of concrete and if the structure is under sufficient water head, brick laid in bituminous mastic is substituted for membrane. Fig. 2 shows the structure forms described. From the construction viewpoint there is little that is structurally intricate in the steel-concrete box for open-cut subway.

Tunnel Structure—Subway tunnel structure in rock consists of a semicircular concrete arch over each track with a row of columns between tracks carrying a longitudinal girder against which the opposed arches thrust. Tunnel sections in rock are shown by Fig. 4. Soft ground and subaqueous tunnels are lined with cast-iron segments (Fig. 3) with an interlining of concrete to give a smooth surface. The only exception to this structure is a ¼-mile shield tunnel lined with precast concrete blocks.

Station and Track Structure—Station structure is either the steel-frame and concrete construction shown by Fig. 2 or the the tunnel-enlargement structure shown by Fig. 4. Various arrangements of station structure and parts are required by location conditions, but all are of the basic structure types shown. Track construction throughout consists of short block ties set in concrete with an open concrete drain between rails.

While subway structure is largely a repetition of prec-

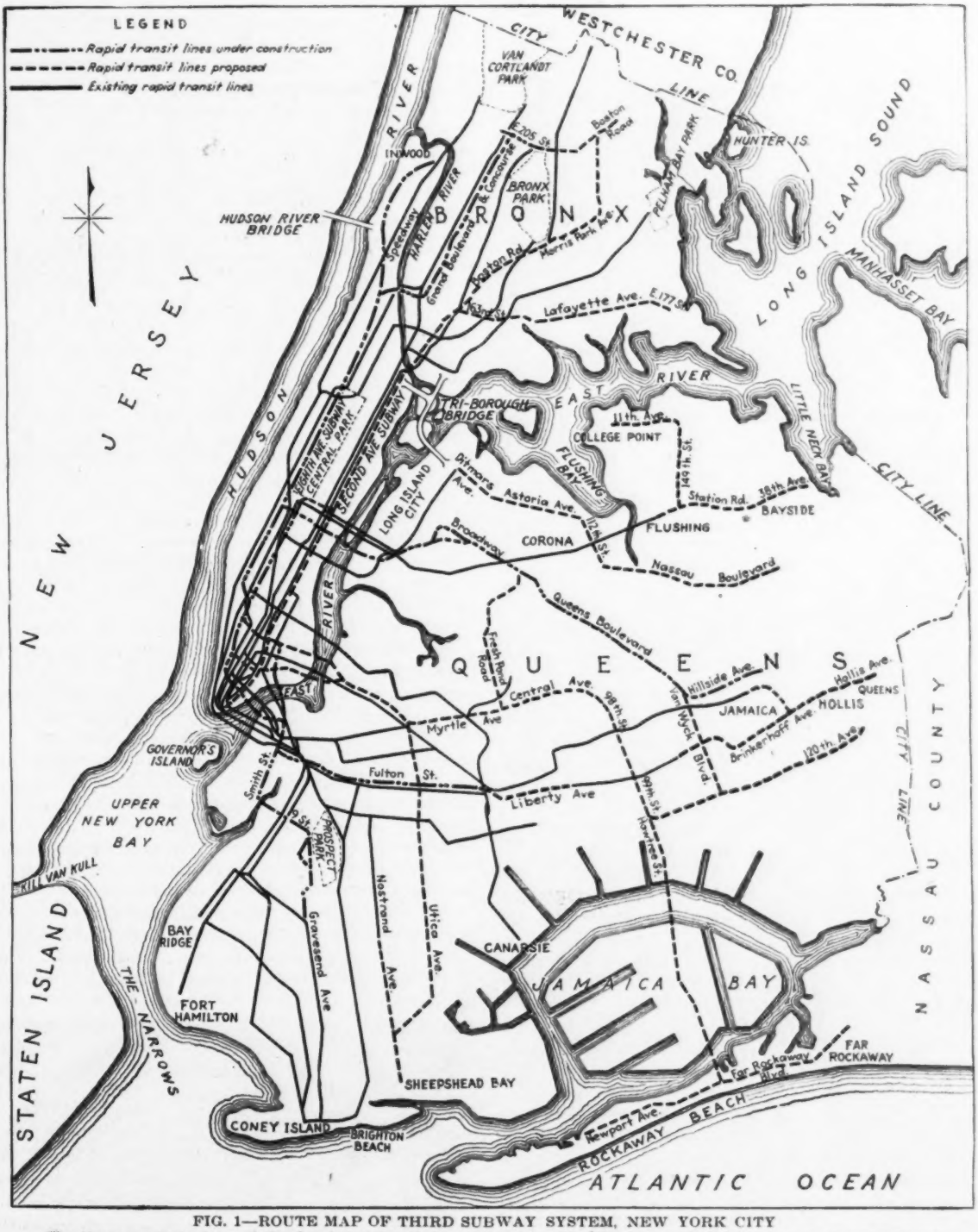


FIG. 1—ROUTE MAP OF THIRD SUBWAY SYSTEM, NEW YORK CITY
The lines penetrate four of the five boroughs of the city and are 55 miles long with 200 miles of track and will cost $650,000,000 ready to operate.

edent, construction technique has developed notably. Subway builders are now doing a higher class job as constructors. Broader planning, foresight and higher technique of construction are exhibited in various ways.

1. The general conditions that have to be met in subway construction and ways to meet them have been determined. Construction is no longer exploration; it is planned invasion with foreknowledge of the obstacles to be expected and with possession of practices and equipment to overcome them. A clear indication of this development is the fact that the contractors for the present subway have been largely men without previous records of subway construction. These men (mostly young men) have struck boldly into a field of difficult and highly specialized engineering construction and have proceeded with certainty and success because of foreknowledge of problems and technique.

2. With appraisal of subway construction there has come systematic construction planning. This is the second broad development manifested in the present operations. By knowing ahead the many kinds of tasks that may be expected in supporting surface and underground

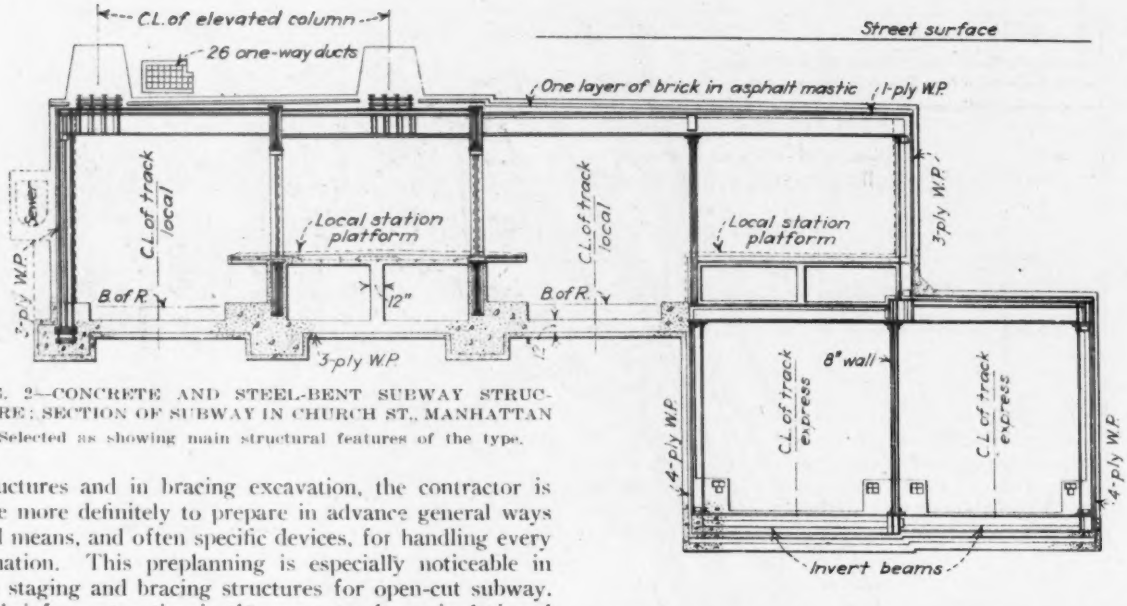


FIG. 2—CONCRETE AND STEEL-BENT SUBWAY STRUCTURE: SECTION OF SUBWAY IN CHURCH ST., MANHATTAN
Selected as showing main structural features of the type.

structures and in bracing excavation, the contractor is able more definitely to prepare in advance general ways and means, and often specific devices, for handling every situation. This preplanning is especially noticeable in the staging and bracing structures for open-cut subway. In brief, construction in the present subway is designed procedure.

3. Alertness in employing the resources of construction and equipment invention is a third development. Well-point drainage, pretest-pile underpinning, torch cutting and welding, and transit mixing are examples, but there has been a determined reaching out all along the line for every device and process in the long list that active invention in recent years has offered the engineering constructor. Subway construction has become the eager and shrewd adapter of the improvements in all construction fields. Besides this keenness in taking hold of recent inventions, purposeful mechanization is evident throughout. Power-shovel excavation, mechanical mucking in tunneling, mobile crane handling of structural steel and the application of power distinguish the work wherever they can be economically employed.

4. Greater construction skill has also developed, going beyond the application of improved methods and machines to sureness and precision in their employment. In shield tunneling particularly advance in the perfection of detail and surety of procedure is the improvement that stands out, although there is recorded a notable innovation in the use of precast-concrete block lining.

5. A highly trained organization for subway building has been developed. Since 1900 subway construction in New York has been virtually continuous under an agency which has changed only in name and degree of authority. In large measure its personnel consists of executives and technicians developed by training and promotion. Many of these men have a record of service dating from the first subway construction. They possess a fund of recorded knowledge and personal experience, therefore, which is applied with exactness to design of structure, preparation of specifications and execution of construction.

Construction Problems

The problems of subway construction fall into two broad classifications: preparing the emplacement for the permanent structure, and constructing permanent structure. In shield tunneling the two operations are virtually one, and in rock tunneling and open-cut construction they are commonly in close sequence and often simultaneous. Clearness and brevity is served, however, by considering them separately.

Preparing Emplacement—The controlling problems of excavation for subway structure are support of the street surface and surface structures, support of subsurface street structures and support of buildings. These problems are greatest in open-cut construction. They largely disappear in tunnel subway. While tunneling must have regard for settlement due to loss of ground, there is no direct interference with existing structures. Open-cut construction requires the virtual repossession of the street from the surface to the bottom of the cut for the full width between curbs and sometimes outside the curbs to the building lines. Hence, in general, nothing that exists on or under the street can be considered as remaining undisturbed. The significance of this fact appears when it is stated that 85 per cent of the subway is open-cut construction, and during construction every service of the streets has to be maintained.

Traffic is dense on the streets occupied by the subway except in a few outlying sections of the city. It can be interrupted only for short periods and must be unrestricted in character and normal loadings. The problem

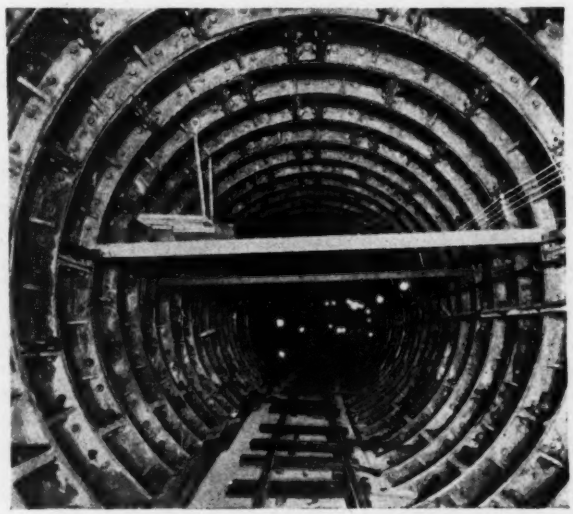


FIG. 3—SHIELD-TUNNEL SUBWAY STRUCTURE
View taken in Fulton St. tunnel. Invert concrete placed; full section will ultimately be similarly interlined with concrete.

of street surface is, then, the two-part one of removing old surface and substituting new surface under which subway construction can proceed, and of keeping the substitute surface so that it places no restrictions on traffic. Perfect solution either in substitution or in future maintenance is rarely possible, and this fact is recognized, but the requirement broadly and even in considerable detail is preservation during subway construction of a street surface which offers no reduction in traffic facilities. Surface structures come into the problem largely only where there are surface railways with their heavy underground trolley conduits or elevated railways with column footings well below the street surface. The street railway is essentially a part of the street-surface problem and the elevated railway support is a part of the building-underpinning problem; they are so handled in the actual construction.

In general, the larger problem is offered by the understreet structures. These comprise, first, the normal services for water, sewerage, gas, heat, pneumatic carriage and electric services; and, second, special structures such as intersecting subways and railway tunnels. Care of the normal services is provided for by the structure supporting the street surface. The present system of street

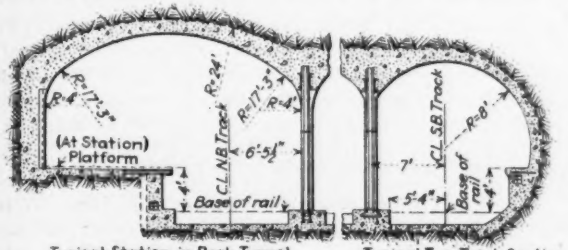


FIG. 4—SUBWAY STRUCTURE IN ROCK TUNNEL

decking, with its extensive use of steel girders and heavy planking to provide a suitable roadway for street traffic, to support understreet conduits and to give maximum working space underneath for subway-construction operations, is one of the most notable advances shown by the present subway work.

Special underground structures furnish a separate problem requiring a different solution in nearly every instance. Manhattan and parts of Brooklyn, Queens and the Bronx are threaded with the subway lines of the first and second systems, the Pennsylvania railway tunnels and deep subsurface station tracks cross Manhattan, and the Hudson tubes extend from far downtown to 33rd St. Building a new subway line through the same territory requires the new lines to pass over or under the old lines, a problem in design and construction comparatively rare in the older subway work.

The number and variety of special crossings of subway and tunnel in the present work make it possible to indicate conditions and requirements only by an example or two. Fig. 6 shows a particularly complicated line layout at the intersection of 53rd St. and Sixth and Eighth Aves. in Manhattan. In Jay St., Brooklyn, the new line crosses under one old line and over another within a city-block length. All these constructions introduce intricate problems of bracing and excavation and of underpinning heavy subway and tunnel structure.

Underpinning in general is a very large problem of the new subway operations. Every building along the open-cut subway whose foundation is not on rock or does not extend below subway subgrade in earth is underpinned. The number of these buildings is astonishingly large, and some of them, because of age or weight, exact the limit of the underpinning constructor's care and skill. Where the subway runs under existing elevated railway it has to be temporarily supported and finally underpinned. Finally, each problem is made exacting by the precision imposed on the constructor. Excavation for subway has to be fitted between structures whose permanent character, continuous operation or value eliminates any leeway in alignment, elevation or dimensions. This exactness is the responsibility of the contractor; he has, through his own engineering staff, to make sure that he is performing his work precisely. The city's engineers check the exactness of the performed work and require rectification if it is in error. Broadly, the policy of engineering supervision is to assume and to exact high constructor's skill.

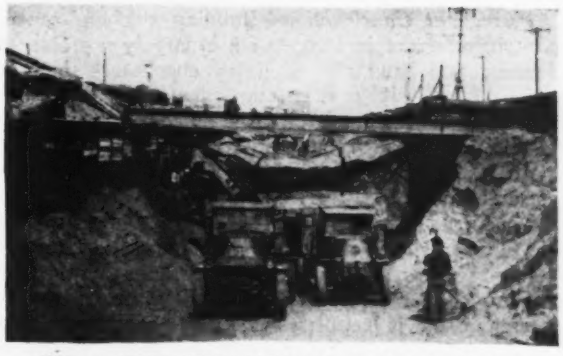


FIG. 5—EASY EXCAVATION IN OPEN COUNTRY, QUEENS BOULEVARD, FOREST HILLS

Speaking broadly in conclusion, the problems of preparing excavated cut for subway are: supporting street surface and understreet structures and underpinning buildings bordering the streets. Excavation and removal of earth and rock and bracing and draining the excavation, which are ordinarily the controlling problems of open cut with vertical sides, are incidental open-cut subway-construction problems. They are not small problems, because the volumes are large and the working conditions are difficult, but they also are not the controlling problems. These statements are more especially true of the open-cut subway; in subway tunneling, as in all tunneling, excavation and the handling of excavated material are the controlling problems.

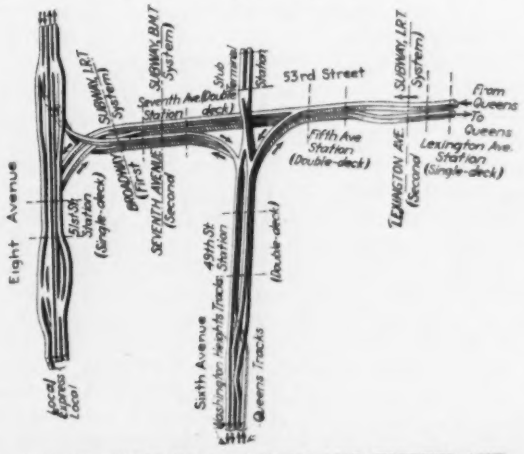


FIG. 6—JUNCTION OF SIXTH AND EIGHTH AVE. SUBWAYS WITH 53rd ST. LINE TO QUEENS
A notable example of complex line construction to avoid intersections at grade.

Permanent Construction—Building steel-and-concrete permanent structure in open cut is largely a problem of delivery and handling. Delivery encounters much the same difficulties that it encounters in city-building construction. These are largely the outcome of street congestion. Handling requires the rather piecemeal lowering of the steel and concrete through the street decking or hauling it in with trucks, and the introduction of steel and concrete forms between the staging timbers supporting the street deck and understreet services. Handling has been made a little less free perhaps by the close maintenance of street decking in the present subway operations, but it has been made much more free by the open structure and calculated location of the staging. In general, steel members have been kept to lengths and weights which facilitate handling in contracted quarters.

Broad Contract Requirements

Contract terms, specifications and contract plans are prepared in great detail for subway work. Contract terms and specifications are in part general for all like kinds

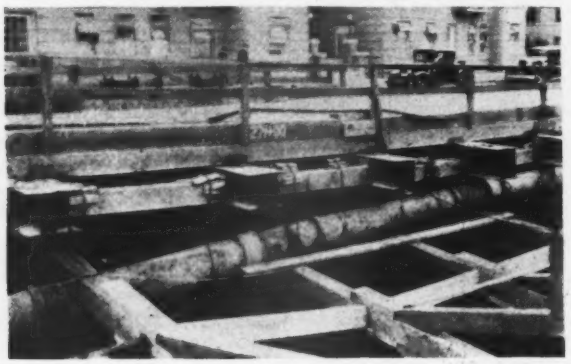


FIG. 7—20-IN. WATER MAIN SUSPENDED FROM STREET DECKING

of work and in part specific for the particular operation. The plans are always for a specific operation. All, it is emphasized, are in great detail and cover many items; in important contracts there are often 300 to 400 bid items. Subway contracts include all the usual requirements for compliance with plans and specifications and they need no explanation. There are certain broad contract requirements that have bearing on the general subway-construction problem.

It is required that the contractor shall provide for maintenance of street services and for the integrity of all structures on, under or bordering the streets. It is a fundamental construction requirement that all functions of the streets shall be provided for during construction. This places a severe demand on skill and experience, and accordingly these qualities are stressed in appraising bidders.

The contract provides that the contractor must have liquid assets equal at least to 10 per cent of the amount of the bid, or of three months' minimum estimate, whichever is the larger. In all major contracts the 10 per cent provision governs on account of the length of the contract period. The conditions require that the contract be thus liberally financed because: (1) the contractor must finance the work for approximately three months before receiving the first partial payment under the contract and must provide plant, furnish securities and bear the heavy expense of supporting an organization during this period of three months, because after sufficient work has been done to entitle the contractor to a partial estimate, the Board of Transportation may require a month to measure the work and prepare the estimates and the comptroller may require another month to audit and approve the bills; (2) the contractor must pay all expense of the work out of his own capital before any partial payment is made; generally, partial estimates are approximately equal to the amount of work expected to be performed each month; (3) 15 per cent of the amount of every partial estimate is deducted from the payments until the work is two-thirds completed. These conditions necessitate ample funds and their possession by the bidder is exactingly demanded in awarding the contract.

FIG. 8—ROOF STEEL IN PLACE UNDER STREET DECKING

Organization for Subway Construction

The Board of Transportation of the city of New York has charge of the design and construction of subways. John H. Delaney is chairman of the board; Robert Ridgway is chief engineer; John R. Slattery is deputy chief engineer; A. J. Raisman is chief designing engineer, and H. N. Latey is chief electrical engineer. The organization is divided into the following seven divisions, with the division engineer of each named: design,

FIG. 9—UNDERPINNING FOR BUILDING ALONGSIDE CUT

New York Subway History

Since 1900 the city of New York has undertaken the construction of three rapid-transit subway systems and there has been built in addition a company-owned system. The exact mileage of rapid-transit lines is as follows:

	Route-Miles		Single-Track Miles	
Contract No. 1 (completed 1904)	22.02		65.53	
Contract No. 2 (completed 1908)	3.18		9.19	
Total contracts 1 and 2		25.20		74.72
Contract No. 3 (city-owned I.R.T.)	50.97		158.26	
Contract No. 4 (city-owned B.M.T.)	49.98		149.03	
	100.95		307.29	
Less joint operation	8.59		26.71	
Total contracts 3 and 4 (major portion completed in 1920; extension still in progress)		92.36		280.58
Total contracts 1, 2, 3 and 4		117.56		355.30
Nassau St. line, and 14th St. from 6th to 8th Ave.—under construction		1.27		3.47
Total contracts 1, 2, 3 and 4, including lines under construction		118.83		358.77
Company-owned I.R.T. lines	41.85		122.56	
Company-owned B.M.T. lines	55.37		153.64	
Total company-owned lines		97.22		276.20
Grand total I.R.T. and B.M.T. rapid-transit systems		216.05		634.97
Independent system—1st step (begun in 1925)		55.00		200.00
Independent system—2nd step (not commenced)		100.00		295.00

Note: Above figures are exclusive of yards, crossovers and sidings. Single-track miles include

The cost to June 30, 1930, of the city-owned rapid-transit system for construction and equipment, including labor and material, real estate, engineering, and excluding interest during construction, administration and law, is:

Contracts 1 and 2	$106,000,000
Contract 3	201,000,000
Contract 4	215,000,000
Independent system	318,000,000
Total	$840,000,000

The estimated total cost of the first step in the independent system for construction and equipment is $650,000,000, and contracts have been awarded aggregating slightly over $400,000,000.

For the second step of the independent system, which has not yet been submitted to and approved by the board of estimate, the estimated cost of construction and equipment is $600,000,000.

In regard to the independent system, which has been under construction since 1925, and the proposed second step, recently announced, any mileage or cost figures are continuously subject to change due to modifications.

The first subway line, 23 miles long (begun in 1900 and completed in 1904, was described in a series of articles in *Engineering News*, beginning Jan. 20, 1902, and ending June 11, 1903.

The second subway system, begun in 1913 and largely completed in 1920, was described in a series of eleven articles by F. Lavis, published in *Engineering News* from Oct. 1 to Dec. 31, 1914.

The third subway system, with 55 miles of line, was begun in 1925. A full description of the routes, track arrangement and type design of standard and special structures was published in *Engineering News-Record*, June 17, 1926. Succeeding articles on individual operations have been published in the issues of July 8, July 22, Aug. 5, Sept. 9, and Oct. 7, 1926, and June 17, 1929.

The present article is the first of several to be published reviewing general construction developments, problems and practices on the third subway system.

C. E. Conover; division I (construction of lines in Manhattan below 57th St. and in Brooklyn), J. O. Shipman; division II (construction of lines in Manhattan north of 57th St., and in Queensborough and the Bronx), John H. Myers; tunnel division (all subaqueous tunnel construction, regardless of location), J. B. Snow; track, R. H. Jacobs; station finish, J. T. Kane, and materials inspection, G. L. Lucas. Each section is in charge of a resident section engineer. Several sections are grouped under the direction of an assistant division engineer.

The Editor Goes Afield

—*Traffic Congestion in Chicago*

Loop District to Be Relieved by New Subway and Additional Outlets—Construction Projects Along Lake Front

TRACTION consolidation, authorized by the voters July 1, is the biggest item of interest in Chicago at present. New construction in the plan includes a subway to extend from Chicago Ave. and Franklin St. to Eighteenth and State Sts. This will be of box construction, but in a form different from the typical New York and Philadelphia type of steel bents and concrete arches. Final plans have not yet been completed, but it is believed that the subway will be of shallow open-cut construction with a continuous station extending from the river to Congress St. This station area will have a continuous loading platform and an overhead mezzanine extending the full length. The city is already getting a taste of what the streets will be like during subway construction, for the Commonwealth Edison Co. has a large portion of the loop district torn up in placing new conduit lines.

Traffic congestion in the loop district is being reduced by the construction of several new outlets. On the Wabash Ave. bridge both trunnion piers have been completed and erection of the superstructure is under way by Ketler & Elliot. This will be the first bridge at this site, providing an additional roadway from the loop district to the north. The north approach will cut through several blocks of old buildings. The first of several additional outlets to the south will be the extension of Franklin St. across the railroad track on a viaduct 1½ miles long, to cost approximately $8,000,000.

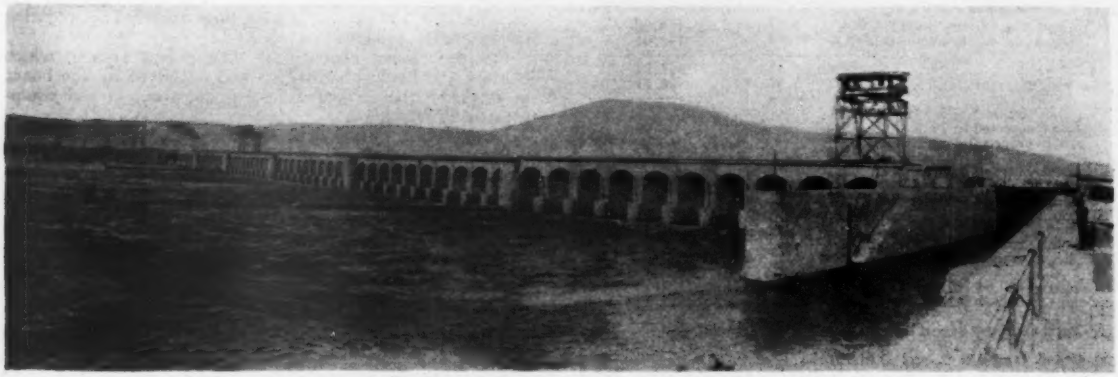
The outer drive through Lincoln Park, which suffered extensive damage from storms last winter, is now being protected by heavy riprap along the lake front and by a series of pile-crib groins built out into the lake. Work has been started on the approaches of the new Outer Drive bridge, to be built across the mouth of the Chicago River. This will do much to relieve present congestion on the Michigan Ave. bridge.

Construction work has been started on buildings for the 1933 World's Fair, to be located along the lake front from Grant Park to Jackson Park. The administration building will be the first to be erected.

Progress in Control of Nile for Irrigation

Second Raising of Aswan Dam, Begun This Year, Will Bring Storage to 4,000,000 Acre-Ft.—Nag Hamadi Barrage, in Upper Egypt, to Increase Flood Peaks, to Be Completed This Year

By H. E. Babbitt
Professor of Sanitary Engineering, University of Illinois



THE NAG HAMADI BARRAGE FROM THE WEST BANK
The towers supporting the east end of the five overhead cableways can be seen on the opposite bank of the river.

No country in the world is so dependent upon a single river as is Egypt upon the Nile, a stream that furnishes navigation for hundreds of miles and irrigation for the land under cultivation. Today the great storage dam at Aswan is being raised for the second time and another barrage, the last of the series, is well on toward completion. The accompanying article by Professor Babbitt, based on a very recent visit to Egypt on his return from a trip around the world, gives up-to-date information on both of these interesting construction works and fits them into the picture of Nile control for irrigation. —Editor.

IRRIGATION in Egypt is the mainstay of the country. The construction, maintenance and operation of irrigation works are the most important governmental activities. Without irrigation more than half of the cultivated lands of Egypt would be lost, and without the Nile there would be only a desert. From these facts arises the familiar phrase, "The Nile, it is Egypt."

The Aswan Dam is the most important of the irrigation works in Egypt, because all of the water used for irrigation during the dry season is impounded by it. The functions of the other irrigation structures on the Nile in Egypt are to distribute the water passed through the Aswan dam and to raise the flood peaks of the river sufficiently to reach the most remote of the irrigated lands. A list of the principal irrigation structures on the Nile is given in the accompanying table.

The First Raising of the Aswan Dam

Construction of the first dam at Aswan was completed in 1902 at a cost of $15,000,000. The elevation of the roadway on the top of the dam was 357.52 (feet above datum), with an allowance of 9 ft. 10 in. of freeboard to the water surface in the reservoir. The dam was 6,560 ft. long, and the water surface at full reservoir was at El. 347.68, giving a maximum depth at the dam of 128 ft. and storing 264 billion gallons of water.

The Nile in flood carries a large amount of silt which is an important adjunct to its irrigation value. The impounding of this silt-bearing water caused concern as to its effect upon the capacity of the reservoir. To lessen the silting up of the reservoir it was decided to maintain a constant current near the bottom by discharging water through sluices in the lower part of the dam. To obtain sufficient area for the sluiceway openings the dam could not be placed in the narrowest part of the river, hence its present location and great length. The extra expense involved in this construction was justified as shown by the results of an exhaustive survey, recently completed, which reveals no silting in the reservoir. It was realized at the time of the construction of the dam that its height was insufficient to impound all of the water required for irrigation, but the height of the structure was limited by the desire to avoid the inundation of the Temple of Philæ. The value of the impounded water was so quickly appreciated after the completion of the dam that opposition to the raising of the dam and the inundation of Philæ was overcome. The dam was, therefore, raised to roadway El. 373.92 and the freeboard was diminished to 3 ft. 3 in., as experience had shown that wave action was inconsiderable, because of islands in the reservoir and the relatively short fetch of the wind. The work of raising the dam was completed in 1912. The volume of storage was increased to 663.3 billion gallons and the water was backed up the river for a distance of 185 miles. The plans for raising the dam were made by Sir Benjamin Baker. The methods used were so ingenious and successful and they have such a bearing on the plans for the second raising, now under way, that their details should be understood.

In raising the dam it was desired to disturb the original structure as little as possible with the additional masonry. The junction was therefore made by inserting wrought-iron rods on meter centers all over the down-

IRRIGATION STRUCTURES ON THE NILE

Name	Loation	Date of Completion
Sennar barrage	165 miles below Khartum	1925
Aswan dam	590 miles above Cairo	1912
Esna barrage	490 miles above Cairo	1909
Nag Hamadi barrage	367 miles above Cairo	1930
Assuit barrage	250 miles above Cairo	1902
Delta barrage	15 miles below Cairo	1890
Zifta barrage	17 miles below Cairo	1903

stream face of the dam. These rods were embedded in both the old and the new masonry for a distance of 4 ft. The added layer of masonry was 16 ft. 10½ in. thick, with a slope of 1½ vertical to 1 horizontal, the same as the downstream face, against which it was laid. The new masonry was supported upon the rods a slight distance above the face of the old masonry and the space between the new and the old work was left, without filling, for two years to permit of settlement, movement and consolidation. The space between the new and the old work was separated into compartments 23 ft. in length along the face of the dam, by the construction of keyways in which a wedge-shaped stone with a broad, flat face protruded from the new masonry into a properly shaped recess or groove cut in the face of the old work. The joints in these grooves were made with pure red lead to permit the movement of the stones without rupturing the joint. Weep holes, reaching through the face of the new masonry, were constructed about 15 ft. apart vertically with three holes per compartment. These holes were provided for drainage during the two-year interval that the space was left open and as an aid in the grouting ultimately planned. Two perforated, 1¼-in., wrought-iron pipes were placed in a vertical position in each compartment. At the end of the two-year period the space between the new and the old work was filled with grout through rubber hose thrust into the perforated pipes. The compartments were filled in stages, only sufficient grout being used to fill a compartment between two rows of weep holes in one day. Upon completion of the grouting the additional vertical portion of the dam, composed of rubble masonry, was placed without unusual precaution other than to roughen the plane of contact between the old and the new work. The results were entirely satisfactory and no trouble has been experienced, the dam acting as a homogeneous structure.

The Second Raising of the Aswan Dam

Plans for a second raising of the Aswan dam were inaugurated by the appointment by the Egyptian government of an international commission whose members were H. L. Cooper of the United States, W. J. E. Binnie of England and H. E. Grüner of Switzerland. This commission met at Aswan in November, 1928, to consider the following questions:

1. Is it safe to raise the dam to impound water to El. 393.60?

2. Which is the best design of those submitted? If none is considered satisfactory, the commission is to submit its own recommended design.

3. To what extent is it safe to modify the dam to permit of hydro-electric power development?

The commission prefaced its report upon these questions with the following important statements:

(*a*) It is our opinion that the existing Aswan dam represents engineering of a high order and of monumental character. We are forced to wonder whether the designers and builders of this great dam were not inspired to special effort by the fact that the dam is built in a land famous the world over for great and enduring monuments. We not only are deeply impressed with all the engineering conceptions that produced the Aswan dam but are especially impressed with the superexcellence of workmanship in executing these plans.

(*b*) We have a very keen appreciation of the fact that the security, health and happiness of more people now depend almost entirely on the safety of the Aswan dam than ever before in its history.

(*c*) We are conscious of the grave responsibility assumed by any engineer or by any government of Egypt when they undertake to increase the load on the existing dam where the existing masonry has worked so well for so many years.

(*d*) We are of the opinion that no plan for heightening the existing dam should be undertaken that does not first take into most careful consideration paragraphs (*a*), (*b*) and (*c*) of this section. Similarly we are of the opinion that no plan for heightening the existing dam should be adopted unless its good influence on the existing work can be demonstrated beyond the shadow of a doubt. Finally no plan should be adopted that cannot be analyzed as to its effect on the existing masonry and as to its certain behavior under any and all future conditions. In other words the adopted plan may be one whose physical effect on the existing monolith and whose labor as new work can be accurately foretold.

The principles upon which the commission based its considerations of designs for the raising of the dam were: (1) All stresses must be determinate. (2) No temperature stresses should be transferred to the old masonry. (3) The added portion should relieve, so far as possible, the existing structure of stresses brought about by changes of temperature at the downstream face of the dam. (4) All stresses after heightening should be well below the requirements of conservative modern practice. (5) Expansion joints should be provided to prevent the formation of cracks being brought about by changes in temperature. (6) The old masonry should remain in place and be disturbed as little as possible.

SETTING THE FIRST STONE IN THE FOUNDATION OF THE NEW ASWAN DAM, JUNE 12, 1930

(7) The design should not detract from the architectural beauty of the present structure but should, if possible, improve it.

The commission concluded that it was safe to heighten the dam by about 30 ft., basing its conclusions on the considerations that: (1) The rock on which the structure rests is capable of carrying a high compressive stress. (2) The masonry of both the original and the added structures has been well executed and the commission is very highly impressed therewith. (3) There is no sign of fracture between the original dam and the portion subsequently added, so that the whole structure acts as a monolith. (4) The cracks observed are not of a nature to affect the stability of the existing structure. (5) The toe of the dam is well protected against erosion by the existing aprons.

None of the submitted designs being found satisfactory, the commission recommended a design of its own suggested partly by some of the submitted designs. The principal feature of the adopted design consists of buttresses to be erected between the sluice gate openings on 23-ft. centers. At El. 287, the elevation of the sill of the lowest sluices, each buttress is to be 19½ ft. thick in a direction normal to the face of the dam and 14 ft. 5 in. wide parallel to the face of the dam. The downstream face of the buttresses will slope at the rate of 1.14 vertical to 1 horizontal, leaning against the face of the dam, which now slopes at the ratio of 1.5 to 1. The buttresses will terminate at El. 372.28, at which point

they will be 3 ft. 3 in. thick and 4 ft. 10 in. wide. From El. 372.28 to the top of the new work false buttresses supported from the newly heightened body of the dam will carry the architectural lines of the true buttresses to the top of the dam. An open space 1 in. wide will be left between the true and the false buttresses to prevent the transfer of stresses between them. The buttresses are to be constructed of reinforced concrete, faced with ashlar masonry, and they will not form an integral portion of the dam but will add strength to it only through their weight resting against the downstream face of the dam. They will be joined to the old masonry up to El. 287. From this level to El. 348.04 the buttresses will rest and slide upon an unlubricated, non-corrosive wrought-iron plate 1¼ in. thick. The face of the old masonry will be dressed smooth beneath the plate and for ¾ in. on each side, and the plates will be laid loose in their beds, thus allowing free movement of each buttress in all directions. Above El. 348.04, the top of the wrought-iron plate, the buttress will not be in contact with the dam but will extend as a cantilever to El. 372.28. The raised portion of the body of the dam will consist

SMOOTHING THE FACE OF THE OLD MASONRY TO RECEIVE THE NEW BUTTRESSES, ASWAN DAM
The finished height of the dam will be at the base of the crane on the steel scaffolding shown on top of the dam.

of cyclopean masonry faced with ashlar on the upstream and downstream sides. This part of the work will be constructed in blocks 31 ft. 2 in. high, 29 ft. 3 in. thick by 23 ft. in length along the axis of the dam, with joints between blocks coming midway between sluices. Alternate blocks will be constructed after long periods of time. The joints between blocks will be left open as expansion joints, the watertightness of the structure being assured by a joint of soft asphalt between the concrete and the masonry facing of the upstream side of the dam.

The commission concluded that with this design it is safe to raise the water to El. 400.16, with the roadway on the top of the dam at 403.44. It is planned to raise the water at first to El. 396.88, with the probability of raising it to 400.16 or higher at a later date. There will be 1,320 billion gallons, or 4,000,000 acre-ft., in the reservoir at El. 396.88, backing up the water for 230 miles in the river as far as Wadi Halfa on the Sudanese border.

The banks of the river are so steep at the dam site that the length of the dam will be increased but slightly. A new lock must be constructed at the west end of the dam, the additional lift being made in a single lock, requiring five locks to raise traffic over the dam. In addition to the heightening of the dam and the construction of an additional lock, all the sluice gates will be rebuilt and strengthened. The commission concluded that the proposed heightening represents the extreme of safety and that no further heightening should be attempted.

The estimated cost of the work is $12,500,000 with an additional $10,000,000 for expropriation of lands and other damages. The work is to be completed in 1932, but revisions and additions to the plans will probably delay final completion until 1933.

The Nag Hamadi Barrage

The Nag Hamadi barrage will be the last of the great structures to be built in Egypt to control the Nile for irrigation purposes. This barrage is located in a region of upper Egypt still dependent upon basin irrigation—that is, irrigation accomplished by inundating the land during flood, allowing the suspended silt to settle on the land and then drawing off the excess water. The maximum heights of the flood peaks of the Nile are irregular. Since much of the land cannot be reached when the flood peaks are low, the Nag Hamadi barrage has been designed to raise the flood peaks to a desired height. The barrage will not impound water nor will it aid, for some years, in the distribution of water during the dry season. Until the completion of more impounding reservoirs on the upper Nile the Nag Hamadi barrage is to be used solely to increase the height of flood peaks.

The structure is 2,700 ft. long between abutments, with an additional length of 167 ft. to include the lock at the western end of the dam. The floor level of the foundation is at El. 198.44, and the coping blocks on the top of the structure are at El. 237.14. The structure is designed to withstand a head of 14 ft. 9 in. against the gates. It is constructed on a pervious sand foundation; the impervious concrete base of the dam being lengthened to give a hydraulic gradient of 18:1—that is, the length of travel of water through the sand along the impervious portion of the base of the structure is eighteen times the allowable head against the gates. The total horizontal distance from the upstream to the downstream edge of the apron is 339½ ft.

The lowest elevation to which the foundations will be carried is 182, with the riverbed elevations varying between 190 and 203. The impervious portion of the foundation consists of a monolithic concrete slab extending the full width of the river under the dam, with a maximum thickness of 9 ft. 10 in. Dry rubble covered with rubble masonry or concrete blocks is used in the upstream and downstream aprons. The aprons and the impervious foundation are more substantial, both in thickness and width, than on older structures, the greater width and thickness being added as a result of experience with them. The axis of the barrage is 114 ft. 9 in. below the upstream edge of the apron. A cutoff trench, filled with concrete 4 ft. 11 in. thick between two rows of steel sheet piles, extends 29½ ft. below the floor level of the foundation,—that is, to El. 168.90. This cutoff wall is located under the upstream edge of the piers forming the abutments in which the sluice gates are supported. The center line of the cutoff wall is 30 ft. 3½ in. above the axis of the barrage. Another cutoff wall, formed of a single row of steel sheet piling, extending to El. 175, is located 69 ft. downstream from the axis of the barrage. The heads of the piles in both cutoff walls extend 3 ft. 3 in. into the concrete foundation.

The upstream cutoff wall has already saved the structure from collapse. On Feb. 2, 1930, the cofferdam in the middle of the river failed, with a result that a section of the upstream apron and foundation slab were under-

SETTING MASONRY IN A PIER, NAG HAMADI BARRAGE
Note the large number of workmen.

mined and broken. The destruction stopped at the cutoff wall, so that no damage occurred to the piers and repairs were relatively easily effected.

There will be 100 sluice gates in the barrage, each with an opening of 19 ft. 8 in., arranged in ten groups of ten gates each. The groups will be separated by piers 13 ft. 2 in. thick, the piers between gates being only 6½ ft. thick, with the exception of those in the west group, which are 7 ft. 4½ in. thick. Most of the piers are 27 ft. 10½ in. high to the springing line of the arch between them, the arch having a rise of 3 ft. 11 in. There are three different openings to the gates: 20 ft., 23 ft. 3 in. and 26 ft. 6¾ in., respectively. The gates are lifted by two power cranes traveling on 80-lb. rails placed upon the copings. The piers are composed of rubble masonry faced with dressed granite for a height of 7 ft. 10 in., the remainder of the height being dressed limestone ashlar and limestone mosaic. The cut waters on the upstream side are formed by the intersection of two circular arcs centered in the face of the pier with radius equal to the thickness of the pier. The downstream ends of the piers are semicircular in plan, with the diameter of the semicircle equal to the thickness of the pier. The thinnest piers are 51 ft. long, upstream to downstream edge, and the thicker piers are 52 ft. 2½ in. long. The roadway on the top of the structure is 20 ft. wide with a 24-in. gage light railway for inspection cars.

The lock at the western end of the barrage is 52½ ft. wide, 262½ ft. long, with floor at El. 191.88, with rubble masonry walls, lined with mosaic and ashlar masonry, 34 ft. 5 in. high, 45 ft. 11 in. thick on the land side and 38 ft. 8½ in. thick on the water side. The lock is spanned by a steel swing bridge with a span of 96 ft. 9 in. and the lock gates and the swing bridge are operated by hand. The water raised above the dam will be distributed through the Hawis and El Tarif canals on the east bank and the Fouadia canal on the west bank. The Fouadia canal is now nearing completion. Its regulator works, just above the barrage, will be constructed on the same plan as that of the main barrage, with six openings 19 ft. 8 in. wide. The regulators on the east bank will be similar in construction but the completion of the work on the east bank will be delayed by the necessity for the construction of a tunnel through a limestone cliff. This tunnel will be 30 ft. wide, 21 ft. 7 in. high and 3,200 ft. long. The contract for its construction was let this year for approximately $1,000,000, to be completed in 1932.

The contract for the construction of the Nag Hamadi barrage was awarded to Sir John Jackson, Ltd., in April, 1927, for £1,976,555. The estimated cost was £1,990,000 and the highest bid was £3,134,344.

Two of the most striking features of the construction of the Nag Hamadi barrage are the number of workmen crowded on the job and the long overhead cableway for the transportation of materials. The number of men employed upon the work varies between 6,000 and 8,000. The lowest paid laborers receive the equivalent of 40c. for an 8-hour day, skilled stone masons receiving $1.25 per day. It is expected that two masons working together will set 5 to 6 cu.yd. of masonry per day.

There are five cableways suspended over the work, each with a span of 3,200 ft. These are used solely for the transportation of materials, as the spring and swing of the cables precludes their use for the setting of masonry. Stones are placed at a convenient point near their final position and are set with the aid of locomotive cranes. Excavated materials, cement, sand, etc., are conveyed about the job by hand or on camels.

Labor, both at Nag Hamadi and at Aswan, is performed under the highest temperatures in the world. Midday shade temperatures greater than 120 deg. F. are common, and temperatures above 130 deg. are frequently recorded. The temperatures in the sun, where most of the work is performed, are probably above 150 deg. Such conditions cut down the efficiency of the workmen but, in comparison with more temperate climates, there is no loss of time due to inclement weather and no precautions need be taken against freezing, although frosty mornings are not unknown in January and February.

The dam was planned to be completed in three years from the starting of construction in 1927. During the first season the lock and ten arches on the west end were completed above flood level; in the second season 50 arches in the middle of the river were completed; and in the third season the remaining 40 arches on the east end were to be completed above flood level on June 25, 1930. This will permit the completion of the superstructure during the flood peak. The construction of the first season's work was performed successfully behind a steel cofferdam with piles penetrating 20 to 25 ft. The construction of the 50 arches behind a similar cofferdam in the middle of the river had been completed when the cofferdam broke on Feb. 2, 1930, delaying the work about six weeks. Trouble was met in the construction of the east cofferdam, as the confinement of the river to the narrower channel by the middle cofferdam and the completed western portion of the barrage had so eroded the bed of the river as to diminish the penetration of the piles below a safe limit. It was necessary to construct a stone jetty above the work to break the current and to realign the sheet piling in the east cofferdam with a consequent restriction of the working space.

The behavior of the Nile is so well known and so regular that its fluctuations can be expected within a few days of the same date every year and can be predicted both as to date and amount for a month before their occurrence at Nag Hamadi. Early in June, 1930, work was being performed behind the cofferdam with the river rising and freeboard of only about 18 in. to the top of the cofferdam, with perfect assurance that the dam would not be overtopped before the proposed date of completion of the abutments above flood level on June 25.

The Hydraulic Laboratory at Delta Barrage

A striking feature of the design, construction and maintenance of irrigation structures in Egypt is the study of the structures through models made to scale at the site of the work and subjected to hydraulic tests in the laboratory at Delta barrage. A museum of models of

most of the important irrigation structures is maintained at the Delta barrage. In the hydraulic studies the effect of different gate openings, arrangements of aprons, wing walls, abutments, etc., on the flow of water through the structure can be observed through glass channels, and the results are used for modifying the design or the method of control of the gates. The practice of studying structures through models is held in high esteem in Egyptian irrigation practice.

Plans for the Future

The estimated annual water requirements for Egypt's full development are approximately 40,000,000 acre-ft. The flow of the Nile has always been sufficient to supply this amount except during the minimum year in 1913. This was apparently the lowest flood ever recorded for thousands of years and certainly was the lowest shown by the almost continuous record of 800 years. As the proposed raising of the Aswan dam will store only 4,000,000 acre-ft., which will be insufficient for the maximum dry-weather demands, further impounded storage is planned in the upper portions of the Nile.

The works required to meet all demands in Egypt and to give an additional 4,800,000 acre-ft. annually for irrigation in the Sudan include: (1) a barrage at Nag Hamadi (now nearing completion); (2) a reservoir on the White Nile at Gebel Aulia; (3) a reservoir on the Upper Blue Nile to increase the Sudan's supply and to aid in flood control; (4) a reservoir at Lake Albert to complete the storage necessary to meet the ultimate demands of Egypt; (5) a channel in the Sudd region to assure the Lake Albert water reaching the main Nile. It is expected that most if not all of these works will be completed by 1955, unless political conditions interfere. Only political sanction is delaying the construction of the dam at Gebel Aulia for which plans have been completed. The dam will be located 30 miles south of Khartum; it will impound 1,444,000 acre-ft. and will cost about $15,000,000. Extensions and repairs to existing structures on the Nile in Egypt, involving the raising of all of the barrages, are contemplated for the near future, and bids for the raising of the dam at Asyut were advertised for in June, 1930.

CONSTRUCTION SCENE ON THE FOUADIA CANAL NEAR NAG HAMADI

Blame Divided for Detroit Sewer Failure

Both Engineer and Contractor Indicted by Committee Which Finds Collapse of Southfield Sewer Was Caused by Impairment of Foundation and Use of Thin Walls of Porous, Low-Strength Concrete—Open-Cut Reconstruction Recommended

CAUSES of the failure, responsibility therefor and a recommended method of reconstruction of the failed sections of the Southfield sewer, Detroit, Mich., were officially reported to the common council of that city on July 28 by the investigating committee composed of C. G. Wrentmore, A. H. Smith and George H. Ruhling, and the Pittsburgh testing laboratory. The report states that the three failures in the Southfield Road sewer, described in *Engineering News-Record*, July 3, 1930, p. 15, were caused by the removal of the foundation composed of fine water-bearing sand. This fine sand was carried into the interior of the sewer by the groundwater through faulty concrete construction joints and openings developing in the sewer barrel after construction. Insufficient soil investigation, inadequate design, inspection and supervision, together with faulty construction, were held to be contributing causes. The responsibility for the failure is placed jointly on the department of public works and the contractor. It is recommended that the failed sections be rebuilt in open cut on the present line and grade; that the sewer barrel be reinforced where it lies in sand and has not failed; that all leakage be stopped; and that the invert be lined throughout the lower 4,800 ft. with vitrified tile liner plates.

The physical inspection of the concrete of which the sewer is built showed that although the materials were with few exceptions proportioned reasonably in accordance with the requirements of the specifications and should have resulted in good durable concrete, faulty workmanship in placing resulted in thin walls and porous, low-strength concrete in many locations. The infiltration of groundwater made possible by these conditions carried with it in suspension the finely divided quicksand, resulting in displacement of the foundation.

The sewer-wall thickness, including the interior plaster coat, as measured through holes drilled at four points around the barrel, varied from 6¾ in. to 26 in., with the average 11½ in. at the northernmost break, the first one to appear, 17½ in. at the southernmost or second break, and 18½ in. at the break at Ford Road. The specifications required 16-in. minimum wall thickness. The compressive strength of concrete as determined by testing the 6-in. diameter cylinders cored from the sewer barrel at both crown and invert ranged from 987 to 6,171 lb. per sq.in., with the lower values usually found in the material composing the crown. The report states: "The records disclose that a very large percentage of samples showing inferior strength was composed of those taken from the keystone section in the crown of the arch. The evidence brought out in the hearing indicates that a dry mix was used for this keystone." Samples of concrete drilled from the sewer barrel were analyzed in the laboratory and showed pro-

portions ranging from 1:2.6:1.8 to 1:3.4:5.3. The report stated that where these last tests showed evidence of too much sand in the concrete, it might have been due to a certain amount of the finely divided quicksand being carried into the concrete by the infiltering water and is not necessarily proof of an oversanded original mix.

The committee found the alignment and the grade of the barrel to be bad, with frequent variations of several inches in line and occasionally a foot or more. The grade showed frequent pockets, some as much as 2 ft. below the average grade line, not including those places where settlements had been large enough to cause serious cracking of the concrete. No keyways were apparent at any of the construction joints where displacement had occurred. No steel liner plates were found left in place, although their use had been provided for in the specifications when considered necessary.

The three failures were found to have occurred in the same manner—namely, by settlement of the foundation and subsequent failure of the barrel when acting as a beam, followed by a large inrush of sand, a further weakening of the foundation extending along the barrel each way from the break, causing successive short lengths to break and settle and finally resulting in the crushing of the barrel under the load of the overlaying clay.

In the beginning, the opening of cracks large enough to permit infiltration of sand may have been due to settlement of the foundation resulting from disturbance of the sand during construction or from leaks in the invert that were not completely or permanently closed before the sewer was put in service. The testimony regarding the construction points to the former as the more probable.

The committee found that the department of public works should be held responsible to the extent:

"That its bureau of sewer design did not adequately investigate nor in drawing the plans and specifications give due consideration to the soil conditions in which the sewer was to be built.

"That its bureau of inspection did not require the contractors to perform their work in accordance with the plans and specifications in the matters of adequate keying of construction joints, securing sound concrete, cleaning and coating construction joints to secure sound bond, and in one contract, in the matter of thickness of walls.

"That when its engineering department became fully aware of the construction hazards encountered, it did not take effective means to detect inherent weaknesses or fault work. These means should have been applied not only during the period of construction but also in connection with the final inspection.

"That proper instructions for the use of steel-tunnel liner plates were never issued to the inspectors or contractors."

The contractors were held to be responsible to the extent:

"That the concrete walls were not always constructed of the required thickness and quality.

"That not all construction joints were properly bonded or keyed.

"That the barrel was not made permanently watertight.

"That the construction methods used by the contractor were not adequate to secure sound results under the conditions actually encountered."

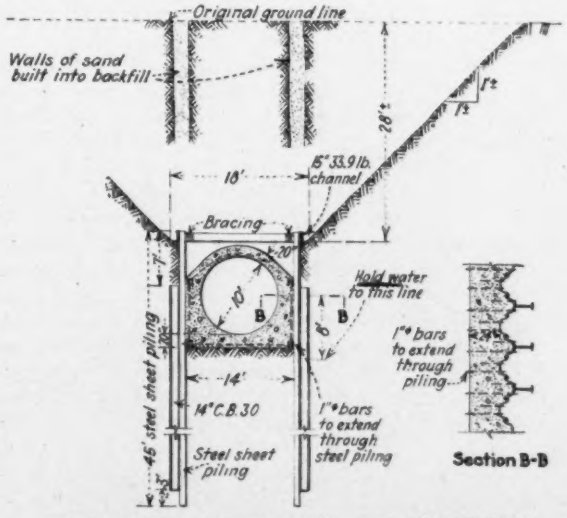
The correspondence between the office of the city engineer and one of the contractors and the testimony presented at the hearings before the committee indicated that the work of driving the tunnel on both contract sections was done under extreme difficulties. The report finds that under these conditions the engineers of the city were negligent in not calling to the attention of the contractor the fact that satisfactory progress could have been made by driving wells and pumping down the level of the groundwater. In addition, it is pointed out that, even though uninstructed by the city engineer as to proper construction methods, the contractor should have engaged engineering advice as to proper methods of prosecuting the work. If the water had been removed from the sand and a reasonable amount of longitudinal reinforcement had been used in the barrel, it is believed that a sound structure would have been secured.

The organization of the office of the city engineer is held to be entirely inadequate. Since this organization was not formulated by the city engineer and cannot be changed by him, its faults are not laid at his door nor are they placed upon any of the personnel under his direction. Fundamental reform in the manner of selecting personnel is recommended to the end that lines of authority and responsibility be clearly defined and intimate contact with the work be maintained by the city engineer and his staff through the stages of design, inspection, testing of materials and supervision of construction.

Recommendations for the reconstruction include the rebuilding of 1,100 ft. of the old sewer. Construction in open cut is preferred to either a relocation of the line in order to avoid the quicksand or rebuilding in tunnel at the present location. Well points driven into the coarse sand well below the bottom of the sewer are proposed to effect a lowering of the groundwater.

Open trench, to a depth of about 28 ft., with side slopes at about 45 deg., is proposed for the upper portion of the excavation. The lower portion of the trench down through subgrade is to be protected by steel sheet piling, reinforced vertically with heavy I-beams.

Those sections of the old sewer which have not failed, but which permit excessive groundwater leakage are to be waterproofed on the inside with ¼-in. steel liner plates covered with gunite. The total cost of the reconstruction is estimated to be $610,000.



RECOMMENDED PLAN FOR RECONSTRUCTING SOUTHFIELD SEWER IN OPEN TRENCH

Old 6,000-Ton Stone Building Moved 300 Ft. to New Location in Pittsburgh

Allegheny County Morgue Shifted Intact to Make Way for New County Office Building—Holes Burned Through Granite Foundation Walls to Receive Steel Grillage—Elaborate Timber Cribbing Required Over Sloping and Uneven Ground

By Joseph White

Engineer, Department of Public Works, Allegheny County, Pa.

MOVING the old four-story granite-block Allegheny County morgue building, weighing 6,000 tons, a distance of 300 ft. to a new location was a difficult job successfully completed in Pittsburgh. It is believed to be one of the heaviest buildings ever to be moved intact in this country. The building was designed 28 years ago by Frederick J. Osterling, Pittsburgh architect, to harmonize with the county court house and county jail, Henry Hobson Richardson's renowned masterpieces of romanesque architecture. The morgue was moved to provide additional space for the new county office building, one of the items of a $43,000,000 public improvement program being carried on by the county.

Moving this structure necessitated supporting on a series of isolated bearing points a building with heavy exterior walls constructed of separate granite blocks—walls designed for continuous bearing under direct compression. The job was carried out without a hitch and without interference with the routine business of the morgue. Autopsies and inquests were carried on throughout the moving period. Water, gas, plumbing, telephone, electrical and refrigeration service were uninterrupted, temporary connections being maintained at all times for these utilities. The ambulances came and went and the public passed in and out as under normal conditions, over temporary roadways and walks.

Inserting Steel Grillage Carriage—The outside dimensions of the morgue are 75x110 ft. To serve as a temporary carriage for the building a steel grillage of 12-in. I-beams, in groups of three, was inserted immediately under the main floor, running transversely across the building, the groups spaced on 30-in. centers. By this spacing every granite block along the course had at least one support, and the grouping of I-beams in sets of three

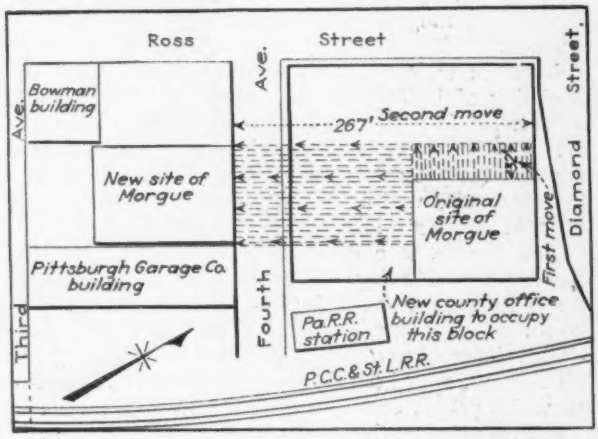


FIG. 1—LOCATION MAP SHOWING ORIGINAL AND FINAL LOCATION OF MORGUE AND DISTANCE WHICH IT WAS MOVED

FIG. 2—6,000-TON ALLEGHENY COUNTY MORGUE JACKED UP ON CRIBBING READY FOR MOVING
Note temporary sewer connection at end of building on right.

allowed working space. These beams were not continuous or spliced, but consisted of two lengths lapping past each other. At places where particularly high and heavy walls had to be supported, as at the towers, short I-beams or needles spanned five to eight groups of grillage beams to furnish additional support.

Directly under the top layer of I-beams and at right angles to them, eight extra heavy 12-in. H-beams, spliced to 118-ft. lengths, were placed to act as main supporting girders. The spacing between these beams varied from 8 to 14 ft., being determined by the location of interior walls. Because of limited clearance on the east and west sides of the morgue in its final location, the outside rows of H-beams had to be placed inside the building walls, the transverse I-beams acting as a cantilever to carry the heavy outside longitudinal walls of the building. A sketch of the grillage layout is shown in Fig. 5.

Burning Holes Through Granite Foundation Wall—Preliminary to inserting the I-beams of the upper layer of the steel grillage, it was necessary to cut holes through two 26-in. exterior granite walls and four interior brick walls. To insert the H-beams required the cutting of holes through a 30-in. granite wall in front, and a 26-in. brick wall in the rear and three interior brick cross-walls. Additional holes had to be cut through the walls to insert the needles where required. Instead of drilling or punching the holes, an oxyacetylene torch and oxygen lance were used to burn through the granite blocks, a current process in cutting slag in steel mills in the Pittsburgh district.

The method of burning out the holes in granite is as follows: A hole 3 in. in diameter was burned by the

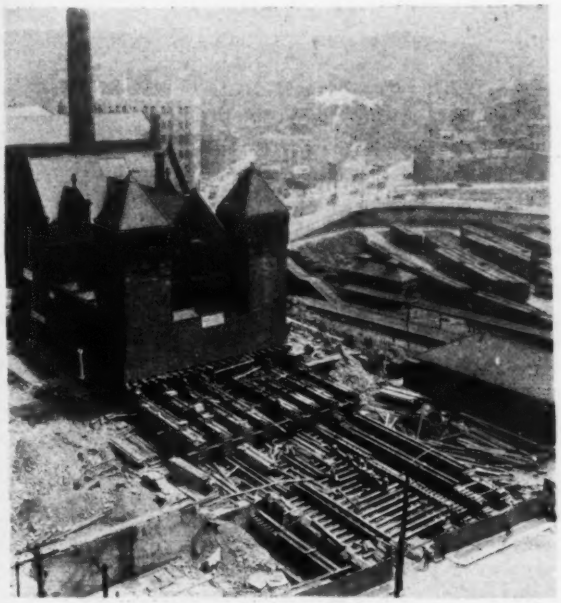


FIG. 3—FIRST MOVE COMPLETED, READY TO START SECOND MOVE
Note old excavations in path of second move.

oxyacetylene torch into the granite to a depth of 4 in. An oxygen lance was then used to complete the hole through the remainder of the wall. This lance was a ¼-in. wrought-iron pipe 10 ft. long. One end of the pipe was inserted in the hole and the other connected to a tank of oxygen. The end in the hole was heated to melting point by the torch, and oxygen was then fed through the lance at 35 lb. pressure. The iron of the lance and the granite, fluxed and a steady stream of molten stone and iron flowed out until the hole was completely burned through.

A series of holes on 6- to 8-in. centers was burned through the granite block for each beam opening and steel wedges and hand sledges were used to chip out the granite between the holes. In the burning of each hole about 8 ft. of the 10-ft. iron pipe was melted.

Raising the Building—In the basement eight rows of wooden block cribbing directly under the eight rows of H-beams supported the screwjacks which were used to jack up the building. The cribbing, 4 ft. high, was built of 6x8x40-in. blocks. Eight rows of jacks, of the regular hand-operated screw type of 50 tons capacity each, 145 to each row and spaced on 10-in. centers, were used in raising the building. One full turn of the screw would raise the jack ⅝ in. One man was assigned to twenty jacks, and at a given signal two men starting at the same point, worked away from each other traveling on one row of jacks, turning each jack a quarter turn. Reaching the twentieth jack, the men then moved back toward each other, turning each jack a second quarter turn. This raised the building $\frac{5}{16}$ in. and after a rest

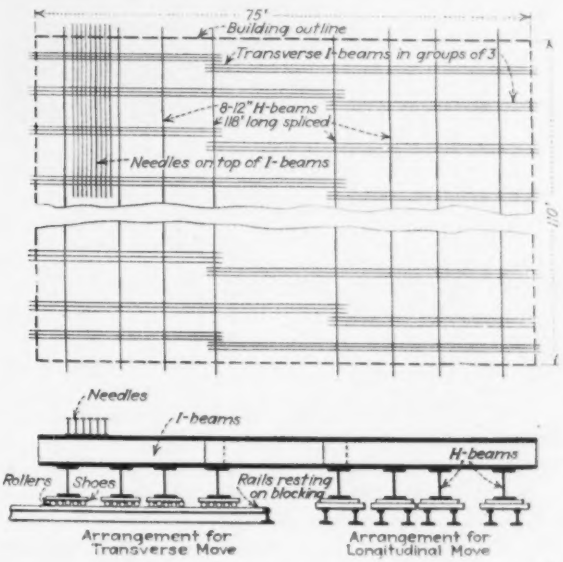


FIG. 5—SKETCH OF I-BEAM AND H-BEAM GRILLAGE
(Not to Scale)

period the procedure was repeated. In this way the morgue was raised 3 in., the supported tier of granite blocks tearing away from the tier beneath, forming a neat cleavage at the joint.

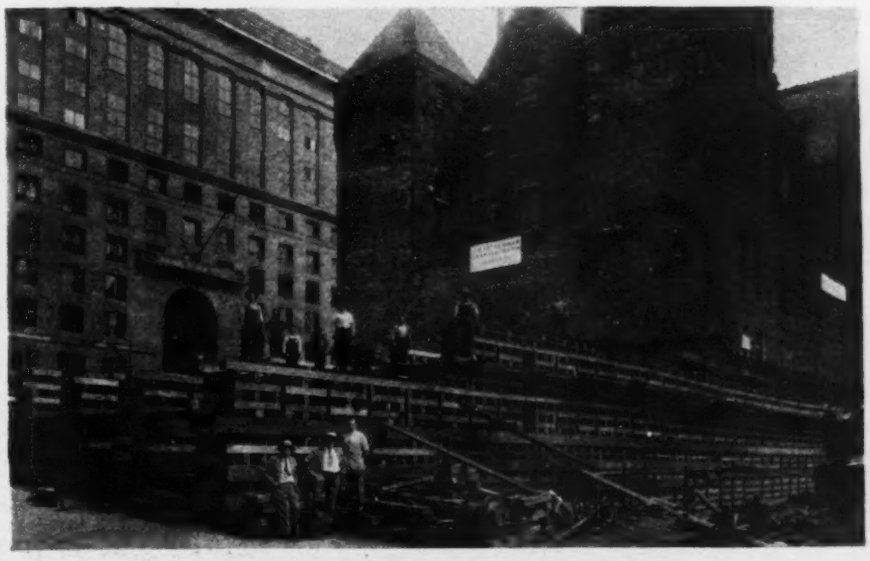


FIG. 4—VIEW OF CRIBBING NEAR FOURTH AVE.

Moving the Building—As can be seen from the map in Fig. 1, the morgue was moved in two directions, 32 ft. laterally and 267 ft. longitudinally. Preliminary to moving, wooden cribbing identical with that placed under the morgue in its original location was built up covering the area of travel. Twenty-two tracks of 100-lb. rails were laid on the wooden cribbing. On these tracks ran solid rollers of special carbon steel, 2⅝ in. in diameter and 36 in. long. The gage of the tracks accommodated this length of roller. Between the top of the rollers and the under side of the H-beams were inserted steel-faced wooden shoes, 4x12x48 in., tapered at the ends. These

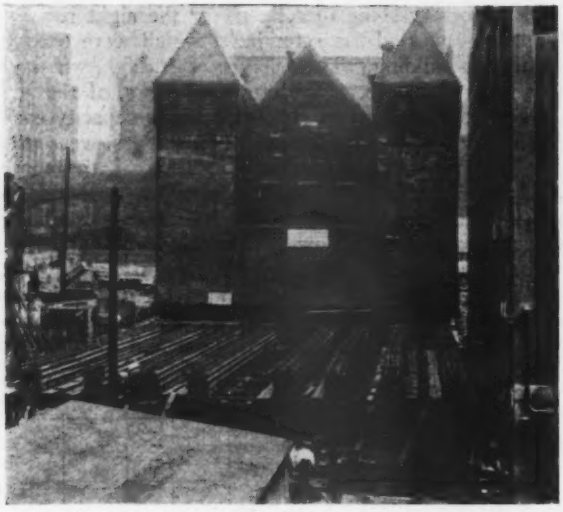


FIG. 6—VIEW OF TRACK ARRANGEMENT USED ON LONG MOVES

One pair of rails for each longitudinal H-beam. Morgue is approaching final location.

steel-faced shoes were used in preference to solid steel to reduce the weight in handling.

Two sets of blocks, using ⅝-in. wire rope, were used in moving the building, the power being supplied by a capstan windlass for each set, each windlass being turned by a team of horses. Each set of block and tackle consisted of a six-pulley block, fastened to slings attached to the H-beams and a five-pulley block anchored to a deadman, the diameter of the pulleys being 16 in. and the weight of the heavier block 750 lb. A steady speed of 20 ft. per hour was maintained.

In the second or longitudinal move unusual hazards were encountered. The natural slope of the ground was in two directions, the soil was unstable, much of it being filled ground, basements of wrecked buildings had to be passed over, and the only street leading to the Fourth Ave. station of the Pennsylvania Railroad, a street with an 8 per cent grade, had to be crossed. Toward the end of the move, clearance between adjacent buildings was slight and the morgue had to be moved over and on top of freshly poured walls and footings that were prepared for the new foundation.

After the morgue was jacked up in its original location, it moved at that elevation to the north curb of Fourth Ave., was then lowered 7 ft., moved across Fourth Ave. to its final site and lowered 8 ft. 4 in. to its final elevation. The cribbing was complicated, at no place being the same depth as at any other point. At one place it was 26 ft. high. The rails were shifted at right angles after the first move had been completed.

Considerable care was necessary to prevent any of the cribbing from bearing on the new prepared foundation walls or column footings which were built at the new site and rested on concrete piling. Three-inch planking was placed between the new concrete footings; upon this planking was placed a solid mat of 6x8x40-in. blocks and upon these blocks two layers of 12x12-in. timbers were laid. On top of this falsework was built up a standard block cribbing over which the building was moved.

The building was moved by the Kress-Oravetz House Moving Co., of Pittsburgh, under the supervision of Frank A. Fees, directing head of the company. County Architect Stanley Roush supervised the morgue-moving contract and designed the new $3,500,000 county office building. W. F. Hadfield was resident engineer on the job. The improvement program, of which the new county office building is a part, is being carried on by Joseph G. Armstrong, chairman of the board of county commissioners, through the county department of public works, headed by Norman F. Brown.

St. Louis and Railroads Agree on Use of Municipal Bridge

ALTHOUGH the Municipal bridge across the Mississippi River at St. Louis, Mo., was completed in 1917 and has been used since then as a free highway bridge, no use has been made of the railway portion of the structure, because of controversy between the city and the Terminal Railroad Association, which serves all the railroads centering at St. Louis. This bridge was built by the city to provide a new cross-river rail route competing with those over the Eads and Merchants bridges, which are controlled by the Terminal association.

The protracted controversy was ended in June by an agreement under which nearly all of the passenger trains crossing the river, as well as a large amount of the freight business of the Terminal Railroad Association and its proprietary lines, will use the city's bridge. This plan includes the construction of a new passenger station in East St. Louis, Ill.

To make the plan fully effective, five additional railway approaches or connections to the bridge are to be constructed, two of them of considerable magnitude, the whole work to cost about $3,250,000. They are to be completed in 1931. These approaches, aggregating about 3 miles, will be built and owned by the city, but funds for the work will be advanced by the Terminal Railroad Association. The sums so advanced, with 5 per cent interest, will be credited against charges due to the city from the railroads for the use of the city's property. The railroads guarantee a minimum annual revenue to the city of $500,000, which is expected to be exceeded very considerably. By this plan the additional work will be paid for out of earnings in a few years.

Coupled with this plan is an agreement with reference to the Eads bridge to meet the desire of the city to remove tolls from traffic on the highway deck of that structure. Two factors limited the scope of this latter agreement: (1) a contract with an electric railway company which operates over the Eads bridge highway deck, the contract running to 1952; (2) the fact that a large tonnage of freight is being trucked over the bridge in completion of railroad deliveries. Under the new agreement all vehicles not hauling goods or passengers for hire are to be exempted from tolls. For this concession the railroads operating the Eads bridge are to receive $140,000 per year, payable out of charges due the city from the railroads for the use of the city's bridge. This sum is approximately half the amount now collected from this class of traffic on the Eads bridge. Provision is made for modification of this latter agreement should occasion warrant.

A summarized history of the Municipal bridge was given in *Engineering News-Record* of Oct. 24, 1929, p. 649, in connection with the description of a new railroad approach to this bridge built by the city. This approach makes the bridge available to the Manufacturers' Railway (associated with the St. Louis & O'Fallon Railway) and the Alton & Southern Railway. Permits for the use of the bridge have been issued to these two companies and operation will soon be commenced.

Two-Course Asphalt Surfacing for Airport Runways

Surface Hardness Under Temperature Changes Controlled By Mixed-in-Place Base Course and Premixed Topping at Burbank, Calif.

By Norman H. Angell
Engineer, Asphalt Division, Standard Oil Company of California

A TWO-COURSE asphaltic surfacing, designed to meet unusually rigid specifications, was provided for the runways of the United Airport, recently completed at Burbank, Calif. On a 2½-in. surface-mixed base course a 2½-in. plant-mixed topping was laid as the most economical and satisfactory type of surfacing for a runway that "must not become excessively hard or soft under the temperature range encountered." About 2,900,000 sq.ft. of this type of runway was provided for this airport.

The airport was built for the Boeing Air Transport Co. and the Pacific Air Transport Co. as a southern terminus for the Pacific Coast air-mail route. For the runways it was specified that the surface (1) must be smooth and not susceptible to rutting or rolling, (2) must drain properly and not puddle, (3) must be reasonable in maintenance requirements over a period of years, (4) must be dustless and (5) must not become excessively hard or soft under the temperature range encountered. The specifications were designed to provide a surface that would be soft enough to cause a tail skid to drag properly and at the same time be hard enough to allow a plane to take off without offering appreciable tractive resistance.

The site of the airport is on the floor of the San Fernando Valley, close to Burbank and about 14 miles or a 35-minute ride from the Los Angeles city hall. Approximately square in shape, as shown in the accompanying sketch, the field contains 237 acres. Although appearing flat to the eye, there is a natural slope across the entire field, the northeastern edge being some 40 ft. higher than the southwestern edge. This fact, together with the coarse sandy soil, made drainage a minor consideration. The drainage problem was further simplified by the low annual rainfall. The field has three main runways, averaging 3,600 ft. long and 300 ft. wide, providing a six-directional field. Although this is expected to take care of any flying conditions which might arise, provision is being made for an increase in runway area if required in the future.

A surface composed of a rather finely graded mineral aggregate, bound with an asphaltic oil, was selected as best suited to the requirements. The type of construction considered most feasible from an economic as well as from an engineering standpoint was a two-course surfacing, the base course to be an oiled surface-mix utilizing the sandy soil of the airport and the top course to be a premixed material with a definite quantity of asphaltic oil.

Experiments on small sections of the field indicated that the oil best suited for mixing with the natural soil should have an asphalt content of between 50 and 60 per cent, the upper half of the range being preferable. The viscosity of this oil should permit uniform spreading and thorough mixing with the type of soil encountered. Sieve analysis of the surface soil were made

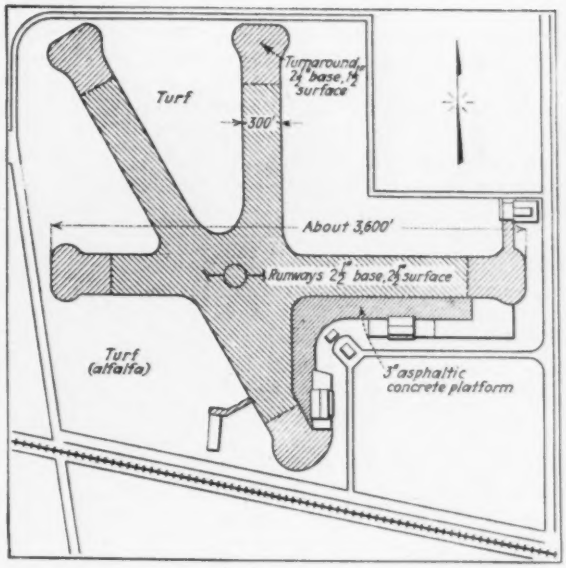


FIG. 1—LAYOUT OF RUNWAYS AT UNITED AIRPORT, BURBANK, CALIF.

at definite intervals along the runways to determine the variation in soil gradation with a view to ascertaining if it would be necessary to vary the amount of oil applied on different areas. Some sections were found to have a high percentage of fine material—that is, material passing the 100- and 200-mesh sieves—while other sections contained little of this material in comparison with the general average. The general average indicated that about 96 per cent of the soil material passed the 10-mesh sieve and that a representative sample contained about 12 per cent of material passing the 200-mesh sieve. Table I shows the analysis of a sample taken at the intersection of the runways and is representative of the type of material found through the area covered by the runways.

Surfaced-Mixed Base—It was desired to prepare the soil so that it could be compacted by rolling into a waterproof and stable subgrade capable of withstanding the landing impact of 10-ton planes. After the runways had been graded, the first application of the oil was made, at a rate of 1 gal. per square yard under a pressure of not less than 25 lb. per sq.in. Temperature of the oil when applied was not less than 175 deg. F. Pneumatic-tired distributors were used with a heavy drag attached between the rear wheels of the truck and the spreading nozzles. This drag obliterated the wheel tracks and smoothed the surface so effectively that the oil went on in an even coat with no tendency to puddle. Twenty-four hours was allowed to elapse between oiling and the initial mixing operation of harrowing. Disk, drag and spring-tooth harrows were tried, with the last seeming to give best results.

TABLE I—SIEVE ANALYSIS OF TYPICAL SOIL AT AIRPORT

	Per Cent
Passing ¼ in., retained on 10 mesh	4.0
Passing 10 mesh, retained on 20 mesh	8.5
Passing 20 mesh, retained on 30 mesh	10.5
Passing 30 mesh, retained on 40 mesh	12.5
Passing 40 mesh, retained on 50 mesh	13.0
Passing 50 mesh, retained on 80 mesh	18.5
Passing 80 mesh, retained on 100 mesh	9.0
Passing 100 mesh, retained on 200 mesh	13.0
Passing 200 mesh	11.0
Total	100.0

Following the first application of oil, the surface was harrowed several times and turned over from four to eight times by blading. With the blades set at a depth of about 3 in. the material was first thrown into windrows to the right and then flattened, then thrown into windrows to the left and again flattened.

In some sections of the field the soft sand made it necessary to use a tractor to haul the distributor. This was found to insure uniform speed with consequent even distribution of oil so that use of the tractor was continued throughout application of the first coat.

The second application of oil was made in much the same manner, the rate being also 1 gal. per square yard. The oil used for this application had an asphalt content of about 60 to 70 per cent. The priming effect of the lighter oil on the surface made it easier to spread and mix the heavier oil. The latter oil is a grade in common use for the construction of secondary highway surfaces by the surface-mix method. Several days of hot weather aided materially in lessening the number of turnovers required and in shortening the time of mixing.

The manner of mixing was the same as that used after the first oiling except that it required more blading to secure an evenly colored material free from lumps or balls. The oiled surface, after mixing, was leveled by dragging and then compacted by rolling with tandem rollers. Two or three rollings sufficed to produce a base which gave evidence of being firm enough to carry any loads to which it might be subjected. There is, of course, some variation in the texture of the base because of difference in composition of the soil at various points of the 70-acre area treated in this manner. At some small spots the soil was of a particularly coarse, sandy nature and there was not sufficient binder or material passing the 200-mesh sieve to cause the oiled sand to pack well. In these small areas the soft spot, usually only a few feet in area, was removed and a properly graded premixed material substituted. This method was considered more economical than attempting to correct the condition by the addition of foreign material plus the application of additional oil, with the extra mixing and blading which such a procedure would have necessarily involved.

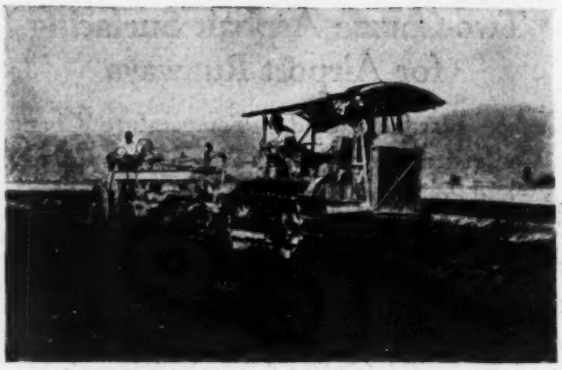


FIG. 3—SURFACE MIXING THE BASE COURSE
Mixed for a depth of 3 in., the finished base was 2½ in. thick when rolled.

FIG. 2—APPLYING FIRST COAT OF OIL
Tractor, required by deep sand, maintained uniform speed and even distribution of oil. Note drag between nozzles and rear wheels of truck.

The oil was shipped in insulated tank cars and was hot enough to spread without additional heating at the point of use. The most convenient spur was about 1¾ miles from the airport site and hauling was done with large tank trucks and trailers which discharged into the three smaller spreaders at the job. Three to four spreader loads were hauled in one trip of truck and trailer; about 40,000 gal. was used per day.

Premixed Top Course—Construction of the top surfacing course for the central sections of the runways followed immediately after completion of the base. The construction of this plant-mixed surface course followed usual practice after the mix had been determined to meet the specification requirements. There was no accepted standard for such a mix, and a certain amount of experimental work was done to make certain that the mix selected would meet the requirements in the most satisfactory manner.

Experimental sections of surface were constructed in such a manner that they formed a continuous strip about 50 ft. wide and 400 ft. long on one of the runways. This strip was composed of eight different sections, varying in the proportionment of the mineral aggregate, the asphalt content of the oil used and the percentage of oil used. It was thought that a surface which would not tear up under normal landings but which would be marked to a depth of about ¼ in. under the action of a tail skid would be of the right consistency. Test landings were made on the test strips by a single-motored type of mail plane and a light training plane equipped with a different type tail skid. All of the sections comprising the strip proved satisfactory under landings, but the one containing 7 per cent asphaltic oil with asphalt content of approximately 70 per cent was thought most satisfactory when items of cost and life of the surface were considered. Table II shows the grading of the aggregate used for the plant-mixed top course.

FIG. 4—PLACING PLANT-MIXED TOP COURSE
Distributed on surface-mixed base course, this material was spread by grader and rolled.

The plant at which the surfacing was mixed was located about 2½ miles from the airport site. From 800 to 1,000 tons of mix was produced by the plant in an average ten-hour day. The aggregate was dried and heated in the same manner as is customary for all "hot mix" pavements. Each batch was carefully weighed out and correctly proportioned. It was found that the hot aggregate and oil mixed very readily, only about fifteen seconds being required to provide a uniform mix with all particles coated.

After being placed on the base by truck, the mix was spread to an average depth of 3 in. by means of a motor patrol grader and rolled to a 2½-in. thickness with a tandem roller. One rolling with a tandem roller was sufficient to provide the desired compaction. About 30 days was required to surface the area of approximately 2,200,000 sq.ft. with this treatment.

For the "turn-arounds" at the end of the runways and for a distance of 450 ft. from the ends, a firmer surface was desired. On these areas the planes will be turned prior to take-off and, because of the length of the runways, it is probable that few landings will be made on them. A surfacing of 1½ in. on the 2½-in. oiled base would give the bearing power necessary. To prevent excessive displacement of surfacing material in event of sharp turns with one wheel strongly braked, the mix was stiffened by using a higher percentage of fine material in the aggregate and a heavier grade of oil having an 80 per cent asphalt content.

TABLE II—GRADING OF AGGREGATE FOR PLANT-MIXED COURSE

	Per Cent
Passing ½ in., retained on ¼ in.	5-10
Passing ¼ in., retained on 10 mesh	10-20
Passing 10 mesh, retained on 40 mesh	45-55
Passing 40 mesh, retained on 80 mesh	15-25
Passing 80 mesh, retained on 200 mesh	5-10
Passing 200 mesh	2-8
Asphaltic oil, 70 per cent asphalt content	7

This material was spread in the same manner as the remainder of the surface course and also given a single rolling while hot. After allowing from ten days to two weeks for the surface to obtain its initial set, it was rolled again, this time at right angles to the direction of the previous rolling. This type of surfacing occupies approximately 750,000 sq.ft., making a total area of surfaced runways of about 2,900,000 sq.ft.

Aprons—In addition to the runways, a durable type of hard-surfaced pavement was desired on an area of 312,000 sq.ft. near the hangars and the administration building, to be used for a taxiway and warming-up platform. After construction of a test section and investigation of the pavement on similar areas on other airports, this area was paved with 3-in. asphaltic concrete laid in one course. The mix used was the coarse aggregate type, and to provide a surface which would have a coarse texture and insure maximum effectiveness of brakes, no seal or flush coat was applied. This is in accordance with the asphaltic concrete specifications of Los Angeles and many other localities on the Pacific Coast. Because the pavement will not be subjected to heavy traffic it was thought advisable to raise the asphalt content from the customary 4 per cent for a mix of this type to 5 per cent.

All engineering and construction work on the airport was under the direction of R. E. Ward, of the Austin Company of California. Construction of the runway surfacing was done by the Southwest Paving Co., of Los Angeles. The writer acted in an advisory capacity for the Standard Oil Company of California, which furnished the oil.

Railway Surveys in Peace River District of Canada

Railway surveys are being made by the Canadian National and Canadian Pacific railways, joint owners of the Northern Alberta Railways, to ascertain the best route to the Pacific coast from the Peace River district. They expect to have their reports completed by the end of summer, when the matter will be placed before the railway directors and the dominion parliament for approval of the route.

English and German Sewage Treatment—II

As Seen by an American Engineer

An Inspection of 30 Sewage-Works in England and Germany Indicates an Increasing Use of the Activated-Sludge Process, of Mechanical Devices, of Separate Sludge Digestion and of Gas Collection and Utilization

By C. E. Keefer

Engineer of Sewage Disposal, Bureau of Sewers, Baltimore, Md.

ONE OF THE most noteworthy advances in sewage treatment in Europe during the past few years has been separate sludge digestion. The best-known examples of this method of treatment in England are at Bath and at Birmingham. Both plants are alike in that digestion is in two stages. The interesting features of the Birmingham plant are the means employed to collect and utilize the gases from the sludge. A number of precast concrete covers float on the surface of the sludge. The gas collects under them and passes through a series of inter-connected pipes to internal combustion engines, direct-connected to electric dynamos.

It is in Germany that one finds the collection and the utilization of gas from decomposing sludge being practiced on the most extensive scale. At a number of plants in the Essen and Ruhr districts the gas vents of old Imhoff tanks have been covered, and the gas is collected and either used at the plant or sold. At Essen-Rellinghausen, Imhoff has constructed a circular digestion tank which is provided with a submerged cover. The gases, which are collected, are burned in a boiler in order to heat water, which flows into the sludge tank at a temperature of about 180 deg. F. Even though the quantity of water added is considerably less than 1 gal. a minute, it is possible to maintain a temperature of about 70 deg. F. in the tank.

Another plant in the Ruhr district of unusual interest is at Iserlohn, where about 17,000 persons are served. The plant is unique in that all the power used for operating purposes is derived from gas evolved from the digestion of sludge. It is believed to be the only plant of this kind in the world. The sewage is treated in storm tanks, Imhoff tanks, contact aerators and activated-sludge tanks. The excess activated sludge is digested in the Imhoff tanks. The gas from these tanks runs a gas engine, which furnishes the power to operate the contact aerators, to compress the air used in the aerating tanks and to operate the submerged paddles in these tanks. Sewage effluent serves as cooling water for the gas engine. This water flows into the sludge chambers of the Imhoff tanks and increases the temperature of the sludge about 4 deg. C.

At Gelsenkirchen, in the Essen district, Prüss has recently constructed six digestion tanks, all of which are provided with concrete covers for gas collection. The gas, which is burned in a boiler, heats water to a temperature of about 180 deg. F. This water passes to an insulated heat exchanger, which consists of a metal cylinder, containing a series of tubes or pipes. As the raw sludge is pumped into the digestion tanks it passes through the heat exchanger and its temperature is raised.

The digestion tanks at the Gelsenkirchen plant, as well as at Frohnhausen and several other plants in the Essen district, have been equipped with vertical pumping units for stirring and mixing the sludge. The impeller of each pump is set in a vertical pipe which extends nearly to the tank bottom. When the pump is started, sludge is drawn into the lower end of the pipe, and after passing through the impeller is discharged on the surface of the sludge. This operation provides a thorough mixing of the digesting materials. Prüss' observations have been that sludge digests twice as rapidly under such conditions as in a tank where pumping is not resorted to and that the rate of gas production is also doubled.

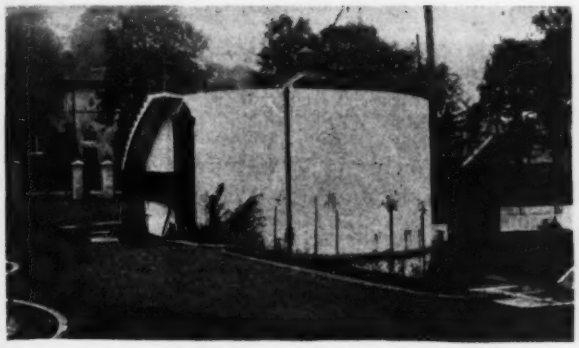
At several of the Imhoff tank installations in the Essen district, where gas is being collected, trouble has been caused by the escape of gas through the thin concrete floors of the sedimentation chambers below the surface of the sewage. This condition persists in spite of efforts made to correct it. In the design of separate sludge-digestion tanks with concrete roofs, Prüss, therefore, plans to cover the tanks with sheet lead.

The collection of gas with its subsequent use at sewage-works or sale to local gas-works has become general in Germany during the last few years. It has been adopted at the Wassmannsdorf plant in Berlin and at Halle, Nürnberg and Stuttgart. At Berlin 194,000 cu.ft. of gas is produced per 24 hours, or at a rate of more than 0.3 cu.ft. per capita per day. The gas is treated with sawdust and bog ore to remove moisture and hydrogen sulphide and is then stored in a holder with a capacity of about 100,000 cu.ft. The gas is used to heat buildings and dwellings at the sewage-works and to operate two gas engines, which develop 360 brake horsepower. The remainder of the gas is burned.

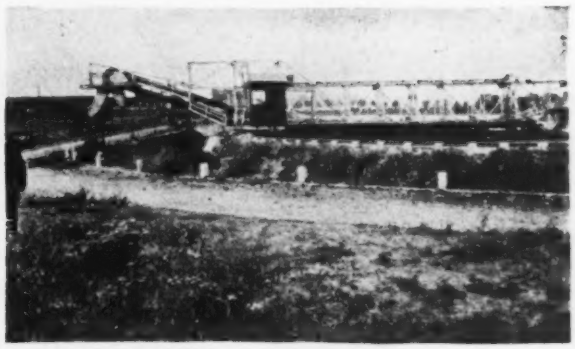
The sewage plant at Halle, which consists of grit chambers, Imhoff tanks and sludge beds and which serves about 200,000 persons, has facilities for collecting and using the gas. All of the Imhoff tanks have been provided with metal hoods. The gas is collected and used for heating purposes and to operate an engine for motive power. The rest is sold to the local gas works for 1c. a cubic meter, and nets about $6,000 yearly.

The gas production at Stuttgart, where 350,000 persons are served by the sewage-works, amounts to 35,000,000 cu.ft. a year, or a little less than 0.3 cu.ft. per capita per day. The gas is sold for 1¾c. a cubic meter, and brings a total return of $17,500 a year. After the interest and depreciation on the gas-collecting system are deducted, the net return is estimated to be $8,500 per annum. The Nürnberg sewage-works affords still another example of gas collection and sale. At this plant about 14,000,000 cu.ft. of gas is collected and sold yearly, with a per capita production of about 0.4 cu.ft. per day.

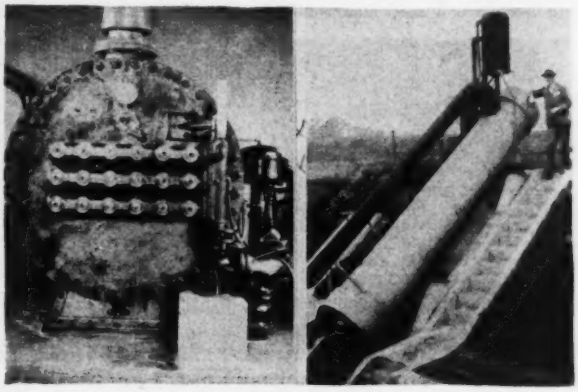
Part I of this article was published last week.—Editor.



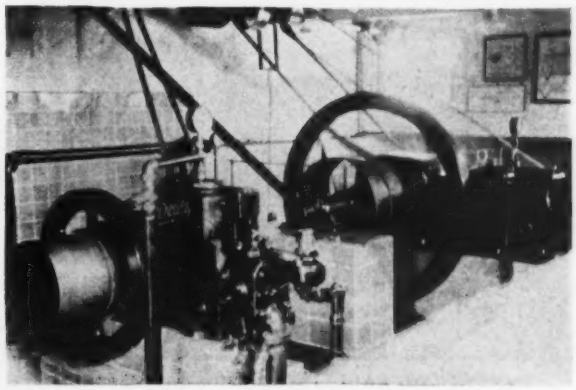
SLUDGE-DIGESTION TANK AT ESSEN-RELLINGHAUSEN
Half of the gas collected from this tank is used to heat the sludge; the remainder is sold to the city gas works.



SLUDGE-HANDLING MACHINE, WASSMANDORF, BERLIN
Machine, operated by one man, removes sludge from drying beds.



GAS HEATER AND HEAT EXCHANGER IN GELSENKIRCHEN ESSEN DISTRICT
Left—Boiler, which burns gas from sludge digester, heats water used to heat sludge. Right—Heat exchanger. Water from heater passes around sludge tubes.



GAS ENGINE, ISERLOHN, RUHR DISTRICT
Engine, which uses gas obtained from sludge digestion, furnishes all power needed to operate contact aerator and activated-sludge units.

PUMPS AT ESSEN-FROHNHAUSEN
Covered sludge-digestion tank is provided with vertical motor-driven centrifugal pumps which circulate sludge in tank.

UNUSUAL SLUDGE-DRYING BEDS AT HALLE
Beds have been surfaced with paving blocks to reduce operating costs due to the necessity of replenishing the bed periodically with sand.

SLUDGE TREATMENT AND HANDLING AT SIX GERMAN SEWAGE-WORKS

No other country, either in Europe or in America, has done as much as Germany in the collection and utilization of gas obtained at sewage plants. More gas is collected and more is sold to municipal gas companies than anywhere else.

Sludge Dewatering—The dewatering of sludge in Europe is accomplished in the same general way as in this country. The pressing of limed sludge is more extensively practiced in England than in the United States. One of the largest filter-pressing plants in the world is at Bradford, where 128 presses dewater the sludge, after which the material is sold to farmers. The sludge liquor from the presses contains large quantities of grease. About 20 tons of this material is recovered daily and sold.

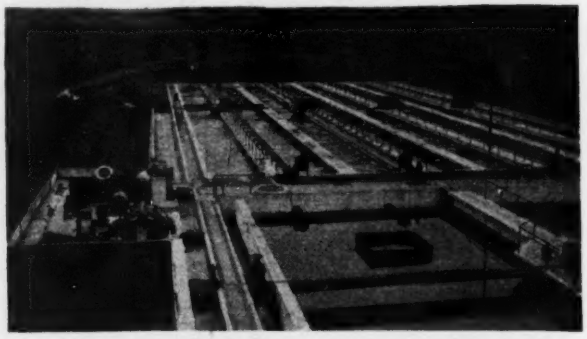
The usual method of dewatering sludge is on drying beds. Activated sludge as well as sludge obtained from preliminary settling tanks is dried in this manner. Beds provided with greenhouse construction have not been built in Europe, one of the possible reasons being their high first cost. It would seem, however, that they would be particularly applicable in England, where the rainfall is frequent even when not high. At Halle the sludge beds, which are made of sand, have been surfaced with paving blocks. Although the first cost of this type of construction is higher than if the blocks were omitted,

DIFFUSED AIR AT BIRMINGHAM

Presettled sewage, mixed with activated sludge, flows with a velocity of 1 ft. per second through an aerating tank, consisting of a series of aerated interconnected channels. At the ends of the channels inclined paddlewheels (Hartley type) give forward movement to sewage. Baffle plates give a spiral motion to sewage and keep sludge in suspension.

VERTICAL PADDLEWHEELS AT SHEFFIELD

Sewage is kept in motion by a number of paddlewheels (Haworth type) seen in the distance. Note in foreground curved shape of channel ends to improve hydraulics.

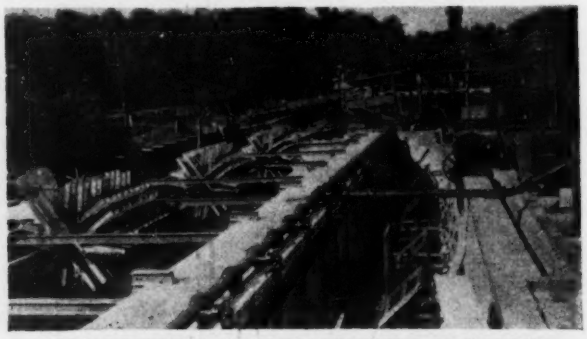


SUBMERGED PADDLES, ESSEN-RELLINGHAUSEN

Settling tank in foreground, with activated-sludge tanks having submerged paddles in rear. Sludge beds and a drum screen for screening activated sludge at left.

INCLINED WHEELS AT STOKE-ON-TRENT

Inclined revolving mechanisms, placed at the ends of four long interconnected channels, contain a number of cylindrical vessels which dip into the sewage.

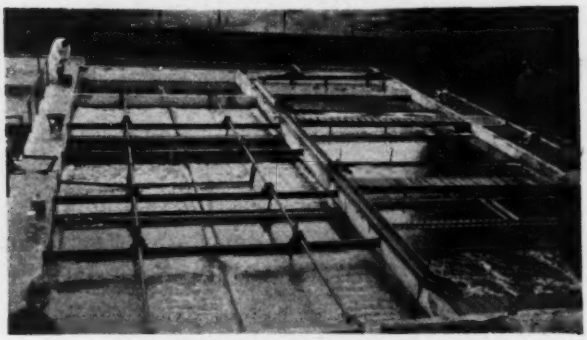


VARIOUS TYPES OF PADDLEWHEELS AT LEIPZIG

At left, wheels partly submerged. At right (in empty tank) wholly submerged. Purpose of paddlewheels is to reduce quantity of compressed air needed for aeration.

REVOLVING CONES WITH SUCTION TUBES AT EPSOM

Aerator set at surface of sewage and at top of a cylindrical tube (Simplex type). Sewage enters tube at bottom of tank, flows upward, and is thrown over tank surface by the cone.



COMPARATIVE TESTS NEAR ESSEN-RELLINGHAUSEN

Three-stage activated-sludge plant using diffused aeration (on right) and contact aerator (on left) gives opportunity to compare these two methods.

FOUR ACTIVATED-SLUDGE PLANTS IN ENGLAND AND THREE IN GERMANY

the maintenance cost is less, as the beds do not have to be replenished with sand periodically. It is claimed that sludge, placed on these beds, drains as well as on sand beds not covered with paving stone.

Machinery for the removal of air-dried sludge has been introduced at the Berlin, Stuttgart and Munich sewage-works. Although the design of the machines differ, they work on fundamentally the same principle. The apparatus runs on permanent railroad rails above the drying beds. Bucket elevators scoop up the sludge, which is discharged either on a sludge-storage pile or in wagons. Each of the machines can be operated by one man at a cost considerably less than when the sludge is removed by hand. At the Stuttgart plant the cost, including the fixed charges on the machine, is about 12c. per cubic yard of dry sludge removed. The operator receives $2.40 per day.

Sludge Disposal—The final disposal of sludge remains as much of a problem in Europe as in America. By far the greater portion of the material is disposed of to farmers or stored in piles about the sewage-works. The extent to which farmers use the sludge frequently depends upon the price of fertilizer, the proximity of the sewage plant to farms, the character and fertilizing value of the sludge and the publicity given by city officials to the use and value of the material. Burial of wet sludge in trenches is still practiced in some places, as at Worcester, England. At Bradford and Birmingham large quantities of this material are treated and sold. The sludge at Bradford is treated with sulphuric acid to recover the grease, which is sold in barrels or tank-wagons. Farmers purchase a considerable portion of the degreased sludge. Approximately 30,000 tons of air-dried material is handled at Birmingham. Some 20 per cent of this is sold for use as a base for artificial manure. An economical and satisfactory method for the ultimate disposal of sludge from both small and large plants remains to be solved.

General Remarks—One striking feature of many sewage-works in Europe is that they have been in service for a number of years. Frequently these old plants have been enlarged from time to time by remodeling them. The result is that a wide diversity of treatment methods is often seen at the same plant. What was 50 years ago the latest type of sewage treatment is often still being used in conjunction with modern methods. For example, broad irrigation and activated sludge can be seen treating the same sewage.

One encouraging feature about the sewage problem in Europe is the high caliber of the personnel at sewage-works. On the whole, the sewage-works manager is better qualified for his position due to his superior technical knowledge than is the average American operator. Generally the control of municipal sewage plants and the design of extensions are under the direction of one man. The experience thus gained in plant operation is of great value in preparing future enlargements.

Conclusions—The application of mechanical equipment in Europe to the solution of sewage problems is beginning to have a more permanent and useful place than ever before. The adoption of mechanically cleaned screens is of long standing. More recent, however, has been the means devised for the frequent removal of sludge from settling tanks by machinery. Moreover, the cleaning of sludge beds by mechanical means is of European origin.

An outstanding advance made during the past three or four years in Europe has been in the digestion of sludge in separate tanks and in the recovery and use of the gases generated. Six or eight years ago this method of sludge treatment was generally looked upon with disfavor, both here and abroad. Now there are several cities, principally in Germany, where separate sludge-digestion tanks have been installed and where the gases are either used for power purposes or sold.

The dewatering and the final disposal of sludge still awaits a satisfactory solution. The drying of sludge in the open on underdrained beds continues to be the usual method adopted for dewatering. Sludge is either lagooned, stored in piles or disposed of to farmers.

Letters to the Editor

A Forum for Expression of Views by Engineers and Contractors

Responsibility for Detroit Sewer Failure

Sir—The article in your issue of July 3 on "Southfield Road Tunnel-Sewer Failures, Detroit, Mich.," is an indictment of both the contractors and the engineers. It especially reflects the work of the contractors and partly absolves the engineers by descriptions of the lines of political authority. It would seem that most of the responsibility could be placed, at least in so far as the engineering and contracting professions are interested, if the terms of the contract were known. What did the contractor agree to do? What did the city agree to do? What did the engineer or the municipal contracting authorities know about conditions before they drew up the contract?

Your article places especial stigma upon the contractor and points out that no keyed construction joint is in evidence. Was any required by the contract? Is there evidence anywhere that a keyed construction joint amounts to anything when the joint is in shear? Should not steel reinforcement have been required to meet a condition of shear? The contractor's work is reported off with respect to lines and grades. Whose responsibility was it to give lines and grades? Was the contractor under any obligation to correct his work after having performed it to lines and grades given? Was it built originally to correct line and grade? Has the tunnel structure settled since the work was completed and caused the invert to be off line and grade? The character and thickness of the concrete are questioned. What were the contract requirements? What control did the engineer exercise? Were there any permissible tolerances?

It does not appear that lack of keyways nor concrete mixture nor thickness of concrete walls were the causes of the failures nor that they contributed even in part to the failures, though your second paragraph infers that such are the tentative conclusions. On the other hand, it does appear that the earth supporting the structure at the point of failure has been displaced and the weight of the earth above has caused the structure to shear and may also have caused much of the irregularity now evident in lines and grades. There is no evidence to show that the breaks occurred while the sewer was in operation and that they have not been caused by subsequent efforts by the city authorities to unwater the sewer, causing the sand to flow from beneath.

Did the contractor assume any obligation with respect to the nature of the ground? Was it his responsibility to construct a tunnel that would satisfactorily resist the forces acting upon it regardless of what the plans and specifications called for? Was he required to know the conditions of the ground before constructing the work either with respect to his obligation in constructing it or with respect to the adequacy of the structure to suit the character of the ground? Did he assume any liability for the structure after it was once completed?

Speaking as a contractor having had an engineering education, an experience of some years in the construction of tunnels, experiences with quicksand and experiences with the settlement and movement of structures and having made a special study of all of the decisions of the United States Court of Claims and the United States Supreme Court with respect to contracts for construction work, it would seem that the responsibility in this instance can be placed squarely upon the city of Detroit. The tunnel very obviously was not designed to care for external pressures nor to meet the condition of shifting quicksand about which the city authorities may have known or should have known. They certainly knew of the character of the ground soon after work was started and then had an opportunity to alter the plans accordingly. There was no steel reinforcement in the tunnel. The sewer, being only 40 ft. deep, could have been supported on piles driven from the surface of the ground.

It appears that the city authorities are now making investigations without any participation by the contractors. Even granting such an investigation to be made by honorable men, no reliability should be placed upon such conclusions without the contractor's right to crossexamine the investigator with respect to his manner of observing the facts and his method of drawing conclusions.

The writer believes that with certain obvious facts already at hand and the contract provisions known, the responsibility as between the contractors and the city would be very readily placed.

ALLEN POPE,
Contractor for Engineering Construction.

Washington, D. C.
July 12, 1930.

The contract for the construction of the Southfield sewer and the specifications under which the work was done were the typical contract and specifications in use at that time by the city of Detroit for all of its sewer construction. As such they were designed to cover sewer construction of different types, including brick, segmental blocks, reinforced-concrete pipe, vitrified pipe and concrete sewers, either in tunnel or open cut. The contract was of the lump-sum type, although it provided for a statement as to the unit price of the sewer per foot of length.

The contract included an acknowledgment by the bidder that he had examined in detail the site of the work and made his own estimates of the difficulties to be encountered, and that he would not make any claim for damages because of any misinterpretation or misunderstanding of the contract. It was agreed that the materials used and the work done should be subject to inspection by the commissioner of public works, who should be the sole judge of the acceptability and fitness of the work and materials, but such inspection should not relieve the contractor from any obligation to furnish materials and perform the work strictly in accordance with the contract specifications. It further provided that the contractor should assume all responsibility for the work, should bear all losses resulting to him on account of the amount of character of the work or because the nature of the ground in which the work was to be done was different from what was estimated or expected. The other clauses of the contract are not pertinent to the subject under discussion.

The specifications, in connection with the advertisement, required that the job be constructed in tunnel. All work to be done under the contract was required to be in accordance with the lines and grades and instructions as given by the commissioner of public works. It was stated that tunnel excavation should be shaped to fit the section of sewer and all space outside the sewer walls should be completely filled with masonry or other suitable material. Tunnels should be sheeted or braced when necessary. When so ordered by the commissioner of public works, the contractor should install additional bracing or sheeting as might be required, but such order, or failure to give such order, should not release the contractor from his liability for damage to person or property under the contract. The excavation should at all times be finished to grade for a safe distance in advance of the completed sewer. Concrete designated as class A should have the proportions of 1 : 2 : 4. The plans required that the sewer be built of either brick or class A concrete. Concrete was required to be placed in layers of specified thickness, in as nearly a continuous operation as practicable and to be worked, spaded or stamped so as to produce a dense mass and surfaces free from voids. Concrete was not to be placed in water. When concrete sewer structures were not monolithic, adjacent sections were required to be joined by a suitably keyed bond, the adjoining surfaces being cleaned of laitance, dirt and loose concrete and coated with neat cement. The other articles of the specification either refer to other types of sewer construction than that of a concrete tunnel or are immaterial in this case.

The article to which Mr. Pope refers was prepared, following a three-day investigation on the ground, in such a way that it was a presentation of undisputed facts only. No indictment of either contractor or engineer was included or even intended, as, in fact, it would have been entirely out of place in such an article. The only statement of an opinionative character made therein is one in which the investigating committee is quoted. All of the other material was obtained from testimony presented before the investigating committee at official hearings, interviews with those who had been connected with the work, examination of plans and actual inspection of the work.—EDITOR.

Road Shoulders of Contrasting Color

Sir—Because of the importance of our present-day road system, it seems to me that safety would be increased by making the shoulder each side of the paved strip with a color contrast to the paved strip. There are certain factors that interfere, but so many accidents occur because a car, traveling 40 to 50 miles per hour, just goes off the paved edge, that some attention to this subject would pay.

Where there is a sharp color contrast between pavement and shoulder, a driver can judge his distance better. Oiled roads and tarred shoulders frequently result in the edge of paving becoming nearly or the same color as paving and are bad medicine when a car just slips off the pavement.

When so much trouble is taken to mark traffic lines and put up signs and markers for curves, a little more attention to the edge of the paved way merits consideration.

A. D. WILLIAMS.

Cleveland, Ohio,
July 5, 1930.

Vibrating Concrete Forms

Sir—Numerous references in *Engineering News-Record* to the practice of hammering concrete forms to assist in producing good concrete prompt me to mention some of my experiences with this type of manipulation and to record my enthusiastic approval of it. My first use of an air hammer on concrete forms was during the construction of a large reinforced-concrete reservoir at Prescott, Ariz., about 1900. I used a plastic mix, which would just flush the water to the surface under spading and tamping. I have continued the use of the air hammer on all important concrete work I have done since, and the results obtained demonstrate that it is almost an essential procedure if maximum density and strength are to be obtained. Probably the good concrete which has been poured without hammering would have been better if the air hammer had been employed.

On p. 9 of "Basic Principles of Concrete Making," by F. R. McMillan, is this: "It can be stated here that were there only sufficient water for the chemical combination, the concrete would be wholly unplaceable. It is significant that this extra water which makes possible the effective and economical use of concrete also introduces most of the difficulties encountered in its use." The application of the air hammer will bring much of this excess water to the surface from which it can be removed. Hammering, in addition, removes air, which is harmful in concrete. It is also a fact that much of the uncombined water can be eliminated in the first place since a drier mix can be used when the forms are subjected to hammering. Although hammering of forms has been used on many projects, to my knowledge no extensive experiments had been conducted to determine its relative benefits.

One point to be studied is the extent to which concrete can be poured in one continuous block without developing serious stresses from shrinkage and cooling, both with and without the use of the air hammer on the forms. I feel confident that such experiments would add materially to the valuable work already done by Mr. McMillan and others devoted to better concrete.

JAMES B. GIRAND.
Departamento de Riego.

Santiago, Chile,
June 28, 1930.

News of the Week

Agreement Eliminates Jurisdictional Strikes in the Building Trades

National Board of Claims to Be Set Up to Decide Disputes as They Arise

ELIMINATION of jurisdictional labor disputes among building trade unions is believed to have been accomplished by the establishment of a national board of claims to dispose of such disputes, at a meeting of the executive committee of the National Association of Building Trade Employers and the building trades division of the American Federation of Labor held in Atlantic City on July 31. The agreement to establish such a board was signed immediately by officials of the builders' association and is expected to be signed by the trades group at the October meeting of the American Federation of Labor in Boston.

By the terms of the agreement, the national board will hear petitions of only international unions. Local and sectional fights will be decided by the international unions, although they may turn them over to the board of claims.

In a dispute between two or more international unions the board may decide the matter or may refer it to arbitrators. In the latter case each union is to appoint an arbitrator, these two to agree upon an umpire. If an umpire cannot be agreed upon, one is to be appointed by the board from three names submitted by the unions. In the case of arbitration the findings will be turned over to the board of claims, which will make effective the decision.

If a union fails to comply with the board's decision, the trades division of the American Federation of Labor is to decide upon a penalty. Where the failure to comply involves an employer, the penalty is to be decided upon by the National Association of Building Trade Employers.

Strikes are absolutely forbidden in the agreement.

Shortage of Water Power in Oregon Becoming Acute

Water-power shortage in Oregon is gradually becoming acute, according to reports being received by the state engineer, but so far no serious results have been reported to the public service commission by the various hydro-electric operators throughout the state. The commission is informed, however, that at almost all hydro-electric stations there are steam stand-by plants in operation due to water shortage.

Bids for New Randolph St. Terminal in Chicago

Bids have been asked for the reconstruction of the Randolph St. terminal for the suburban traffic of the Illinois Central Railroad at Chicago, an agreement having been reached by the railroad and the municipal authorities after several years of negotiation and controversy. This work will be complicated by the necessity of carrying it on under heavy traffic and providing for the crowds of passengers at rush hours. The new site, depressed below the street level, will have three throat tracks opening into six platform tracks with three platforms 800 ft. long. Across it there will be two large viaducts for Randolph St. and South Water St. The work is under the direction of D. J. Brumley, chief engineer of Chicago terminal improvements, Illinois Central Railroad.

San Francisco Bay Bridge Commission Closes Hearings

Following several days devoted to the hearing of sentiments of local interests, the San Francisco Bay bridge commission is making final study of all assembled data to prepare its official report which will be submitted to Governor Young and President Hoover. Local interests were particularly concerned with the traffic problems which would be created at the proposed terminals. However, the commission expressed the opinion that its primary purpose is only to decide upon the most feasible location for the bridge as regards both engineering and economic factors, without solving local problems.

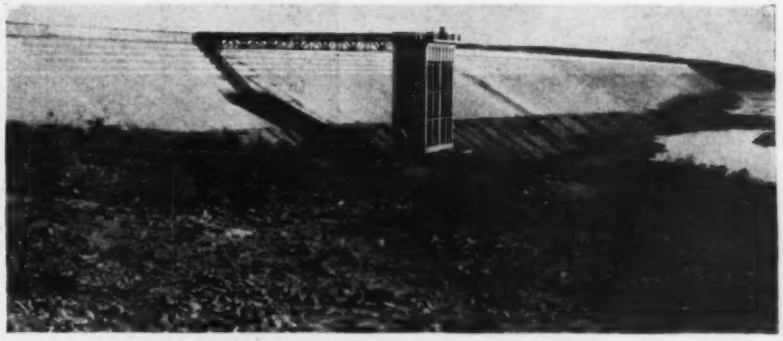
New Organization Is Planned With Aim to Revive Construction

Various Branches of the Industry and Allied Agencies of Finance to Be Represented

ORGANIZATION of a permanent body, to be known as the National Conference on Construction, was the result of a meeting in Chicago on July 30 attended by twenty leaders in the construction industry and in the field of finance. The meeting was called by Julius H. Barnes, chairman of the board of the Chamber of Commerce of the United States, and its object was to propose methods of dealing with business recession by revival of public and private construction.

Aspects of realty finance, including problems of legislation, appraisals of property, methods of home financing and credit practices and possible means of stabilizing the construction industry were discussed. Under the latter heading, problems of taxation and suggested methods of introducing economies into the financing and building of residences and income property were considered at the Chicago meeting.

The decision was unanimous to create the National Conference on Construction, which will comprise representatives of the various branches of the construction industry and allied agencies of finance. The organization will review the outstanding common problems of the construction industry



THE DON MARTIN DAM, MEXICO

This view shows the gate tower and upstream face of the concrete-paved earth embankment of the Don Martin dam on the Salado River, Mexico, for the Nueva España irrigation project. This fill is 3,484 ft. long and adjoins a 525-ft. concrete spillway equipped with regulating gates. The project was designed and the dam built by the J. G. White Engineering Corp., New York, under a contract with the National Irrigation Commission, appointed by the government of Mexico. This commission's work was described in *Engineering News-Record* of March 21, 1929, p. 453, and the construction work on the Don Martin dam in the issue of Jan. 16, 1930, p. 101. The reservoir is said to be filling rapidly owing to recent rains.

and allied industries in an effort to launch a definite program of activity. Factual studies will be made, and recommendations submitted to co-operating agencies, both public and private. Mr. Barnes was named chairman of a committee to complete plans for the formation of the Conference.

Among those attending the meeting, besides Mr. Barnes, were: Benjamin Affleck, of Chicago, president, Portland Cement Association; John Blodgett, of Grand Rapids, Mich., former president, National Lumber Manufacturers' Association; John M. Gries, of Washington, chief, division of public construction, U. S. Department of Commerce; A. E. Horst, of Philadelphia, president, Associated General Contractors of America; E. J. Russell, of St. Louis, vice-president, American Institute of Architects; James S. Taylor, of Washington, chief, division of building and housing, U. S. Department of Commerce, and W. M. Wood, of Decatur, Ill., president, Mississippi Valley Structural Steel Co. and former president, American Institute of Steel Construction.

Conference on Home Building

A White House conference on home building and home ownership has been authorized by President Hoover to formulate plans for a nation-wide survey, financed by private funds, of factors which limit development and of such problems as improved design, equipment, city planning and transportation.

Co-ordination and stimulation of the larger private agencies concerned are recommended rather than new legislation. A study of state mortgage laws is suggested, however. Secretary of Commerce Lamont will act as chairman of the conference and John M. Gries, chief, division of building and housing, Department of Commerce, will be executive secretary. The heads of nineteen national organizations have been invited to participate as members of a planning committee to map out plans and set a date for the conference.

Highway Projects in the Carolinas and Georgia

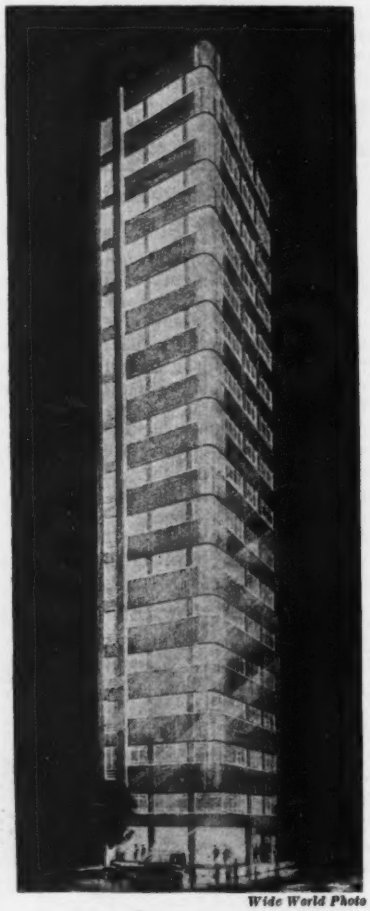
Bids on 164 miles of standard concrete paving, 56 miles of surface treatment, 64 miles of grading and 15 bridge projects, all to cost approximately $5,250,000, have been received by the South Carolina state highway commission.

In North Carolina, the state highway commission recently approved letting to the lowest bidders seven highway projects, totaling $954,545.78. These projects provide for the construction of 60 miles of highway and two bridges.

Ten new Georgia highway projects, amounting to $969,642, have just been awarded by the state highway commission. The work to be done consists of 60 miles of paving, grading and surfacing and the construction of eight bridges.

Contract Awarded for Connecting Railway in California

The contract for building the 112-mile railroad which will connect the Western Pacific and Great Northern was awarded by the Western Pacific to the W. A. Bechtel Co., San Francisco, Calif., and the Utah Construction Co., Ogden, Utah, on a joint bid. Approximately $4,500,000 will be paid for labor in the two years allotted for the work, while approximately $4,800,000 will be expended for material and equipment. The contract calls for the construction of a standard-gage railroad 112 miles in length from Keddie northerly to Bieber, Lassen County, Calif., where a connection with the Great Northern's new line south from Klamath Falls, Ore., will be made.



Wide World Photo

APARTMENT WITH METAL AND GLASS WALLS

Proposed steel-frame apartment building, 50x50 ft., at Chicago, designed with shallow steel floors and thin but soundproof walls and partitions of alloy metal, thus reducing the height and increasing the floor area. Ventilation and electric heating for each apartment. Bowman Bros., Inc., architect.

Board to Investigate Charges of Overpayment at San Gabriel

A board of three engineers has been appointed by the Los Angeles County grand jury to investigate the asserted charges that the contractors on the recent San Gabriel dam excavation had been paid almost $800,000 for approximately 273,000 cu.yd. which had not been excavated. The board, consisting of P. H. Albright, consulting engineer; R. V. Meikle, chief engineer, Turlock Irrigation District, and Prof. Franklin Thomas, California Institute of Technology, will begin work at once on the check survey and a report is expected in about a month.

Appointment of the board by the grand jury was caused by a press report stating that an affidavit, signed by a local engineer, purported to show that not more than 500,000 cu.yd. of material had been excavated at the San Gabriel site. This figure is 273,000 cu.yd. less than the yardage used to compute payment to the contractors. Following announcement of this statement the grand jury requested that E. C. Eaton, chief engineer, Los Angeles County Flood Control District, submit all his records for investigation. These official figures, according to Mr. Eaton, were calculated by two different assistants from accurate surveys made by his department. Quantities thus computed checked very closely, and the final official figure of 773,646 cu.yd. was agreed to at the time of settlement as the basis for payment to the contractors. The contract price for excavation was $2.95 per cubic yard.

In addition, Mr. Eaton requested that the local section of the American Society of Civil Engineers appoint an investigating committee to ascertain the facts concerning the yardage and the affidavit. However, the board of directors of the local section, after carefully reviewing the situation, decided to lend its active co-operation to the grand jury investigation already under way. Subsequent to the affidavit it was reported that two other engineers had checked the figures and believed them correct. These three engineers as well as Mr. Eaton are members of the Los Angeles Section of the Am.Soc.C.E.

Spartanburg, S. C., Asks Bids on $900,000 Sewer Project

The Spartanburg (S. C.) metropolitan sewerage commission has called for bids to be received until Sept. 2 for the construction of two intercepting sewer lines and two sewage-disposal plants, to serve the city and suburban areas. The cost approximates $900,000. Contracts will be awarded as soon as bids can be canvassed and the most favorable bid determined, the commission announces. Harwood Beebe & Co., of Spartanburg, prepared plans and specifications for the project. Morris Knowles, Inc., of Pittsburgh, was consulting engineer.

Buildings for Chicago World's Fair Now Under Way

Two of the main buildings for the Chicago World's Fair of 1933 are now under construction on the site along the lake shore. These are the Administration Building, 340x120 ft., and the Travel and Transport Building, 1,070 x 145 ft. over all. The former, the steelwork of which is nearing completion, is two stories high in front and three stories in the rear, owing to the contour of the ground. As it is a permanent structure, which may be used after the fair by the South Park Commission, it has concrete footings, while most of the other buildings will have footings of heavy plank construction. A special feature of the Travel and Transport Building will be a dome 200 ft. in diameter, suspended from catenary cables attached to twelve 125-ft. towers around the 300-ft. circumference of the central hall. The backstay portions of these cables will extend to the ends of the one-story wings of the building, which are so designed as to form anchorages. This structure is to be completed by 1931 and other buildings will be begun before winter.

All the main buildings will be of light steel-frame construction, having the upper floors composed of trussed joists and steel floor plates covered with asphaltic composition. Roofing will be of felt and gravel composition on wood sheathing. Walls and sheathing between window areas will be of manufactured non-inflammable slabs with insulating lining. The general contractors are the J. B. French Co. for the Administration Building and the John Griffith & Son Co., for the Travel and Transport Building. These two structures will cost $350,000 and $1,000,000 respectively. Lennox R. Lohr is manager of the fair; F. C. Boggs is technical assistant to the manager, Daniel H. Burnham director of works, G. W. Farrier assistant director of works and F. H. McInerney general superintendent of the construction division. The design of the Travel and Transport Building, with its suspended dome roof, is under the direction of Leon Moisseiff, consulting engineer.

Annual Bridge Awards by Institute of Steel Construction

The Mount Hope bridge, erected last year by the McClintic-Marshall Co. across Mount Hope Bay between Bristol and Portsmouth, R. I., has been selected to receive the annual award of the American Institute of Steel Construction as the most beautiful long-span steel bridge built last year. The bridge was designed by Robinson & Steinman, engineers, of New York, for the Mount Hope Bridge Co. It was opened to traffic Oct. 24, 1929. The award for the most artistic short-span bridge was made to the Mount Pleasant bridge, constructed by the Bethlehem Steel Co. over the Harlem Division of the New York Central Railroad at Mount Pleasant, N. Y., for the Westchester County Park Commission. Jay Downer, chief engineer for the commission, designed the bridge, which was opened to traffic in March, 1929.

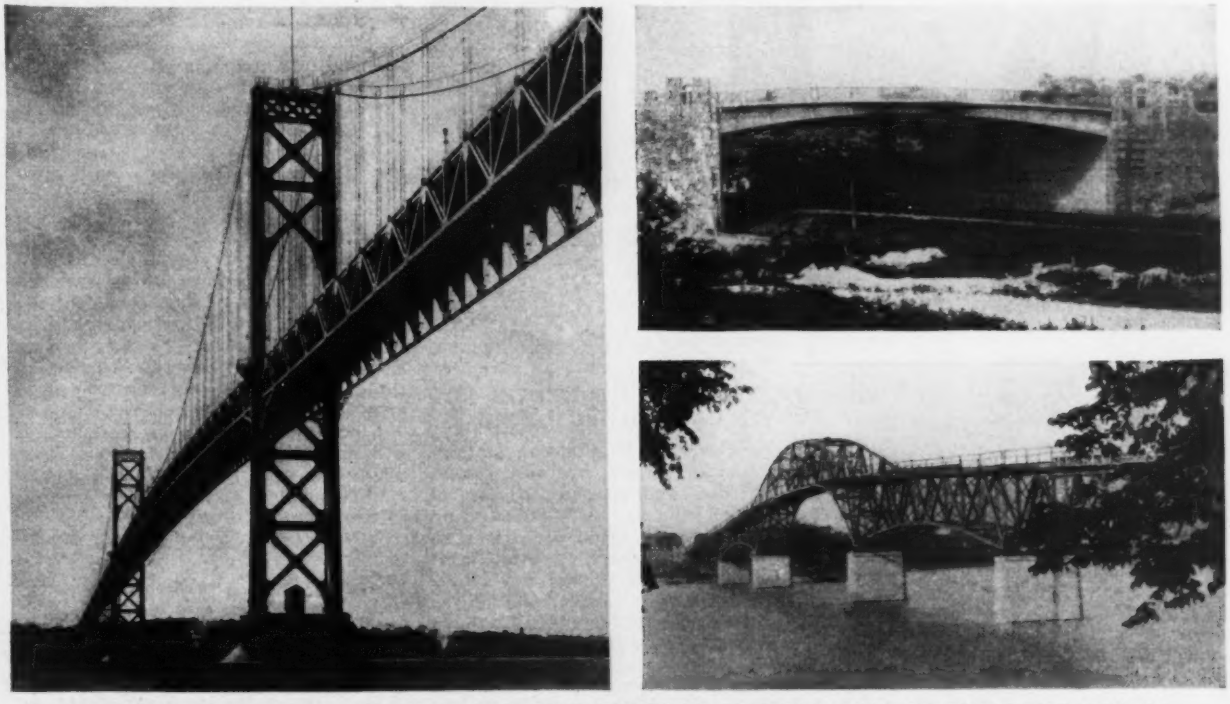
Honorable mention as a most esthetic solution of a long-span bridge problem went to the Lake Champlain bridge, built by the American Bridge Co. across Lake Champlain between Crown Point, N. Y., and Addison, Vt., which was opened to traffic Nov. 30, 1929. Fay, Spofford & Thorndike, engineers, of Boston, designed the structure for the Lake Champlain Bridge Commission.

The jury of award consisted of Gustav Lindenthal, consulting engineer, of Jersey City; Arthur Loomis Harmon, architect, of New York; Hugh Ferriss, architect, of New York; William H. Burr, consulting engineer, of New York; Philip A. Cusachs, architect, of New York; and Dr. J. Horace McFarland, president of the Pennsylvania Fine Arts Commission.

All of the bridges to which awards have been made have been described in *Engineering News-Record:* the Mount Hope bridge, April 12, 1928, p. 585; the Mount Pleasant bridge, March 28, 1929, p. 509; the Lake Champlain bridge, March 21, 1929, p. 796.

Hydro-Electric Project Proposed in Washington

Mayor F. N. Haley, of Anacortes, Wash., and associates, have filed application with the state division of hydraulics at Olympia, Wash., to appropriate 270 sec.-ft. of water from the Cascade River in east central Skagit County for use in development of hydro-electric power, and 60 sec.-ft. for domestic and irrigation purposes. Mayor Haley states his syndicate plans the construction of a concrete dam 500 ft. across the bottom, 800 ft. at the top and 200 ft. high. The first unit of development will cost $2,000,000 and generate about 12,000 hp.



HIGHWAY BRIDGES THAT RECEIVED AMERICAN INSTITUTE OF STEEL CONSTRUCTION PRIZE AWARDS

Left: The Mount Hope bridge, spanning Mount Hope Bay between Bristol and Portsmouth, R. I. Top, right: The Mount Pleasant bridge, over the Highland Division of the New York Central Railroad at Mount Pleasant, N. Y. Bottom, right: The Lake Champlain bridge, across Lake Champlain between Crown Point, N. Y., and Addison, Vt.

Civil Service Examinations for Boulder Dam Work

The U. S. Civil Service Commission announces open competitive examinations for positions in connection with the Boulder dam project and also in connection with design and specifications for the proposed All-American Canal of the U. S. Reclamation Service. The positions to be filled and the salaries are: principal civil engineer, $5,600 to $6,400; senior civil engineer, $4,600 to $5,200; senior electrical engineer, $4,600 to $5,200; senior mechanical engineer, $4,600 to $5,200; civil engineer, $3,800 to $4,400; mechanical engineer, $3,800 to $4,400.

Applications must be on file with the Civil Service Commission at Washington, D. C., not later than Sept. 10. Competitors will not be required to report for examination, but will be rated on their education, experience and fitness. Full information may be obtained from the U. S. Civil Service Commission, Washington, D. C., or from the secretary of the U. S. Civil Service board of examiners at the post office or custom house in any city.

Worcester, Mass., Investigating Problem of Garbage Disposal

The city of Worcester, Mass., has recently engaged Metcalf & Eddy to make an investigation of the problem of disposal of garbage in that city. For many years garbage has been collected by the municipality and fed to hogs on a large farm operated by the city. The number of hogs in 1929 varied from about 4,000 to 6,600. The farm is located on the watershed of Lake Quinsigamond, a large lake used for recreational purposes, and the town of Shrewsbury, which borders the lake, has complained of pollution from the farm.

There is no municipal collection of ashes and rubbish, each householder providing for the disposal of this material individually. In 1929 the city purchased an incinerator having a rated capacity of 60 tons per day. This incinerator is operated by the city but burns only material delivered to it privately by business houses, hotels and individual householders.

Testimony Heard in Coolidge Dam Patent Infringement Suit

Complaint testimony on the Coolidge dam patent infringement suit was completed in Los Angeles on July 26 before U. S. Commissioner H. H. Gordon, who is acting for the court of claims. The government's side of the case will be taken up in Washington, D. C., late in September. The basis for suit is an old patent of a general nature covering a conical type of dam with an increasing radius downward. This is advanced by the complainants as applicable to the multiple arch Coolidge dam built by the bureau of Indian affairs across the Gila River near San Carlos, Ariz., under the design of Major C. R. Olberg, then assistant chief engineer of the Indian service. Col. George S. Binckley is the patentee. He has assigned a third interest in his patent to R. I. Blakeslee, his patent attorney.

After the dam was finished Colonel Binckley filed suit against the construction company, stating that he had not realized heretofore that his plan had been used in construction. The Coolidge dam was at the time one of the most advertised structures in the world. The court ruled that the construction firm, the Atkinson-Spicer Co., of Los Angeles, was not liable and that further proceedings should be against the government through the court of claims. It is alleged that the use of Colonel Binckley's patented method saved 10 per cent on the cost of the dam, and thus the suit is for something close to $1,000,000.

"THE SOWER" PLACED ON TOP OF CAPITOL BUILDING

"The Sower," a 32-ft. statue containing 7 tons of bronze, has been set on top of the Nebraska State Capitol building at Lincoln. A 70-ft. boom on top of the tower lifted the statue to the boom level, where it rested until the boom could be shifted and a new hold taken on the statue, which was then raised to its pedestal 400 ft. above the ground. The statue, which is 19 ft. high and has a supporting pedestal 13 ft. high, cost the State of Nebraska $32,000 exclusive of the sculptor's fee. It was cast by the General Bronze Works, of New York.

Two Projects of California Utility Are Completed

Construction of the 4,580-hp. outdoor generating unit of the Merced Falls plant of the San Joaquin Light & Power Corporation, Fresno, Calif., has been completed at a cost of about $330,000. The height of the dam has been increased 1 ft. and the thickness 3½ ft. on the downstream face, which raised the level of the pond 6 ft. above the old level.

Work has also been completed on the corporation's new 110-kv. tie-line between its Wilson substation at Merced, Calif., and its Ashlan Ave. substation at Fresno, a distance of 48 miles. The line is of steel-tower construction built ultimately to carry two circuits at 220,000 volts but at present carrying only one 110,000-volt circuit of 60,000 kw. Constructed at a cost of $800,000, a record for the San Joaquin company was established when it was built in four months and twenty-five days. E. A. Quinn, general superintendent, supervised the work, which was done under the direction of Claude Wilson, superintendent of tower line construction.

Water-Pumping Facilities Being Improved at Indianapolis

The Indianapolis Water Co. is engaged in a program of improving its pumping facilities, the total cost of which will exceed $500,000. The central feature of the program is the installation of a new steam-turbine-driven centrifugal pumping unit to have a capacity of 40,000,000 gal. daily (40 m.g.d.). The new unit will operate at the Riverside pumping station, and new suction and discharge piping is being installed in anticipation of its delivery.

A new 60-in. reinforced-concrete suction conduit has been extended from the Eighteenth St. filter plant, a distance of 1 mile. The new conduit supplements the existing 48-in. conduit built when the original filter plant was constructed. The combined capacity of the two conduits will be approximately 76 m.g.d. The crossing of the conduit under Fall Creek takes the form of an inverted siphon. Because of the passage of the siphon through a bed of quicksand, it is surrounded by mass concrete to prevent flotation when empty. A new suction well is also being constructed to provide for the increased flow.

When the new pump is installed, it will discharge into a 42-in. steel force main, extending from the new pump to loop connections from all other existing force mains in the station ground.

Bricklayers Oppose Tile Walls

The bricklayers' union in Chicago has made objection to the use of hollow tile in load-bearing walls of buildings, as permitted under the present ordinance. It is claimed that such walls are deficient in strength and in fire-resistant properties.

Brief News

SALARIES of all city employees of Asheville, N. C., beginning with the mayor, who loses $1,500 annually, have been slashed 20 per cent as part of an economy program. This will effect a substantial reduction in the tax rate.

FOUR ENGINEERS have qualified as eligible for appointment as construction engineer on the proposed Pretty Boy dam to be constructed by the city of Baltimore. They are Charles B. Carroll, Youngstown, Ohio; James S. Lewis, Baltimore; John C. Robertson, Annapolis, Md., and John K. Flick, Sudlerville, Md.

RAILROAD CONSTRUCTION in Siberia has been announced by the Russian government in a program covering a period of three years. The length of the new lines and junctions projected will be about 1,100 miles. Foreign companies will be invited to make bids, it is announced.

CONSTRUCTION of a pipe line in Russia from Lake Kaspi to Moscow is assured, as plans have been accepted and survey work has been completed. The line will be about 1,000 miles long and will deliver 1,600,000 tons of oil annually. Much of the pipe will have to be imported.

A TUNNEL through the mountains separating Lake Manapouri and the Teanau River in New Zealand will be constructed by a British-American group. The tunnel will be 6½ miles long and will serve a hydro-electric power plant designed to generate 270,000 hp.

THE CONTRACT FOR CONSTRUCTION, complete with appurtenances, of the structural steel frame for municipal power plant No. 2 of the city of Tacoma's Lake Cushman power project, has been let to O. F. Larson, Tacoma, on a bid of $41,822. The steel frame for the auxiliary unit will require 714,000 lb. of steel frame and plate, and 14,000 sq.ft. of roofing.

BUILDING ACTIVITY in Continental countries continues to be very slow in spite of the cheap money rate. In no country have pre-war figures been reached, the nearest being obtained in France. The reductions in the prices of commodities such as steel and cement have had no influence upon the building trades.

A TYPHOON with a velocity exceeding 100 miles an hour swept across southern Japan and Chosen on July 18, destroying 11,000 structures and badly damaging 31,000 others. Estimates of damage run as high as $50,000,000.

A NEW BRIDGE on the Kiaochow-Tsinan Railway in China was opened to traffic on May 19. This bridge spans the White Sand River about 15 miles from Tsingtao and replaces a truss bridge that was constructed when the line was built by the Germans in 1904. The new bridge is of the deck-plate girder type and is made of eight spans of 98 ft. each, the total length with approach work being 839.8 ft.

EXPERIMENTS in Germany during the last four years with small electric locomotives to pull canal barges have proved that by their use traffic is accelerated and freight rates reduced. Increasing use is predicted for them in that country during the next five years. Approximately 40 per cent of all heavy merchandise is delivered in Germany by canal.

The Business Outlook

Our index has dropped again, from 94.4 per cent of normal to 91.1 per cent, compared with the high point of 114.6 per cent a year ago, and will probably fall farther next week. August will bring definite signs of improvement, beginning with the basic industries, and as we move further into the last half the paralyzing pessimism of recent months will find less to feed on in the comparative records of this year and last. Although the usual seasonal decline of building contracts has set in rapidly, abundant security issues for public and private work in the past quarter will cushion the decline, and the contracts placed so far will carry over into the business activities during the rest of the year.

—The Business Week, Aug. 6.

Engineers' Lunch Cooked by Sewage Gas

A feature of the annual meeting of the Illinois Association of Sanitary Districts was that at the sewage-works at Aurora, Ill., about 60 members and guests lunched in the pump pit on food cooked by gas generated from the digestion tanks. The party also visited DeKalb, Ill., to take part in the dedication of the new sewage-works. Officers were elected as follows: president, Emmet C. May, Peoria, Ill.; vice-president, G. J. Boehland, Rockford, Ill.; secretary, Gus H. Radebaugh, Urbana, Ill.

A Correction

In the report of the death of Allen Hazen published in these pages last week it was stated that at one time George W. Fuller was associated with Mr. Hazen in private practice. This statement was in error. It was Weston E. Fuller who was associated with Mr. Hazen and Mr. Whipple under the firm name of Hazen, Whipple & Fuller, from 1914 to 1922.

Engineering Problems to Be Discussed at Stockholm

Practical engineering problems as well as academic research will be discussed at the third triennial meeting of the International Geodetic and Geophysical Union to be held in Stockholm, Sweden, during the month of August. Formed in 1919 to take up the work which had previously been carried on by smaller groups but which had lapsed during the war, the union now has official standing in 37 countries, all of which will be represented at the convention. The purpose of the meeting is to co-ordinate the work done by governments, research endowments and universities, and especially to reach agreements on problems of international bearing.

Geophysical prospecting for oil will be a topic at the convention. Weather prediction will be taken up and the possibility of daily weather maps of the world similar to those prepared by separate countries will be discussed. Temperature and general drift of the upper air currents are little-known factors the investigation of which will be a topic of discussion. Earthquake studies will be another feature, it being planned to construct an earthquake map of the world.

WASHINGTON NOTES

BY PAUL WOOTON
Washington Correspondent

Arizona to Start Fight on Boulder Dam—Contract Let for Construction of Railroad Connections to the Site

THAT Arizona will fight the Boulder dam project to the bitter end now seems certain. K. B. Pederson, attorney-general of Arizona, stated while in Washington last week that suit would be filed before the next session of the supreme court on grounds of unconstitutionality. The contracts signed by the Interior Department will provide insufficient funds to finance the project as required by law, said Mr. Pederson. The comptroller-general has been asked to rule against further expenditures for construction preliminaries till federal funds are more fully safeguarded.

Secretary of the Interior Wilbur tended to minimize the legal consequences in a recent speech on the West Coast, saying: "Some legal obstacles are still to be expected, but when two Congresses and two Presidents have acted on the matter, it will be pretty hard to stay the hand of government by judicial action."

To Push Railroad to Boulder Dam

Railroad connections to Boulder dam will be pushed immediately under a contract signed last week between the Union Pacific Railroad and the Interior Department, according to J. M. Dixon, first assistant secretary. From its junction point with the subsidiary Los Angeles & Salt Lake line, the spur will

carry through to the floor of Black Canyon over a track distance of nearly 30 miles. This road is divided into three sections. The first, running through to a point known as the summit, will be 29.84 miles long. The cost will be borne by the Union Pacific, which will be compensated through freight revenues. The second section will be a switch yard of 0.32 mile at the summit toward which the government will pay 10 per cent of the construction cost and half the maintenance charges thereafter. Beyond this point 7.13 miles of track goes down the steep incline to the dam site. The contract for this section has not been let but probably will be contracted for at a cost estimated at around $1,600,000. Probably a cog railway will be necessary. This will be under federal operation, since obviously no private firm would have any incentive to handle this part of the line.

Okeechobee Flood Control Work May Start Soon

The State of Florida has been advised by the War Department that construction of the Lake Okeechobee flood-control works can be started immediately if the state will advance the $2,000,000 that it has agreed to make available as its part of the work. The rivers and harbors bill authorizes the project at a total cost of $9,692,000 provided the state appropriates $2,000,000. Since no federal appropriations were provided in the rivers and harbors bill, the work cannot be started until the next War Department appropriation bill has been passed, unless the state agrees to make available its part of the cost immediately. The project as adopted by the government calls for levees 31 ft. above sea level to be built around the lake. In addition, an outlet channel with a discharge capacity of 2,500 sec.-ft. will be constructed and a navigation channel 6 ft. deep and 80 ft. wide will be provided.

Gen. Fries Criticises Levee Construction

In the opinon of Gen. Amos A. Fries, retired engineer officer with long experience in river and harbor work, not enough attention is being given by the War Department to the advisability of constructing levees in the lower Mississippi Valley by floating clamshell dredges. General Fries has served the Orleans Dredging Co. as a consulting engineer. It is the equipment of the Orleans company that is involved in the controversy between private contractors and engineering officers in charge of flood-control work.

General Fries believes that by the use of California methods it will be possible to save a large proportion of the land in the Atchafalaya basin condemned to periodic overflow by the Jadwin plan. This is because it is possible to build the levee lines closer together in swampy soil with floating equipment than can be done with land equipment. General Fries points to the Caernarvon crevasse, which was closed by the floating clamshell dredges, thereby saving $100,000.

While the clamshell dredge builds up a levee with wet material, each layer is allowed to dry sufficiently to prevent the succeeding layer from slipping. It is true that the central portion of each layer does not dry out, but this is regarded as an asset inasmuch as it is claimed that water cannot force its way through such construction. General Fries calls attention to the fact that hydraulic fills are frequently used as cores for high dams.

It is contended by the army engineers, however, that it is not advisable to use for levee construction such wet material as is encountered in the lower valley. While conceding that the method advocated by General Fries is suitable for California, where the material handled consists mainly of quick-drying gravel and sand, they state that the alluvial soil of the lower Mississippi Valley cannot be drained of its water so easily.

Personal Notes

JOSEPH S. STRINGHAM has been appointed commissioner of public works of Detroit, Mich., to succeed John Gillespie, who resigned after the recall of Mayor Bowles in a special election held on July 22. Mr. Stringham is a graduate of the Michigan College of Mines and has been engaged in engineering work for many years. He served Detroit as research engineer from 1924 until 1927, when that position was abolished by the city council.

HERBERT C. WHITEHURST, chief engineer and co-ordinator of the District of Columbia engineer departments, has been named by the district commissioners to take over the engineering work of the engineer of highways, a post made vacant by the retirement of C. B. Hunt, who had been engineer of highways since that post was created several years ago.

R. M. EVANS has been appointed city manager of Dubuque, Iowa, and will take office Aug. 16. For the past 4½ years Mr. Evans has held a similar position in Painesville, Ohio.

GERALD C. FITZGERALD has been confirmed by the Los Angeles (Calif.) city council as a member of the harbor commission. Mr. Fitzgerald, a consulting hydraulic and civil engineer of wide experience, has been identified with the development of the harbor for many years. He is a member of the Fitz-Gerald Engineering & Construction Co.

JOSEPH W. SILLIMAN, secretary to the Philadelphia board of highway supervisors and supervising engineer of permits, has resigned after 22 years of service with the department. Mr. Silliman left Montreal July 25 on a long-planned trip around the world. His position has been filled by the appointment of T. OTTO MAYER.

SYLVESTER F. NORTNER, captain, Engineer Corps, United States Army, has taken charge of the engineer office in St. Louis, Mo., succeeding Major John C. Gotwals, who has gone to Washington, D. C., to take up his new duties as one of the three commissioners for that city.

Society Calendar

AMERICAN IRON & STEEL INSTITUTE, New York City; semi-annual meeting, New York City, Oct. 24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; fall meeting, St. Louis, Mo., Oct. 1-3.

AMERICAN WELDING SOCIETY, New York; fall meeting, Chicago, Sept. 22-27.

NATIONAL SAFETY CONGRESS, Chicago; annual meeting, Pittsburgh, Pa., Sept. 29-Oct. 3.

Obituary

WILLIAM D. BARKHUFF, city engineer of Seattle, Wash., died on July 26 from injuries received in an automobile accident. Mr. Barkhuff, who was 77 years old, served as superintendent of streets of Seattle prior to his appointment as city engineer.

JOHN F. GOLDTHWAITE, city engineer of Lynn, Mass., died on July 29 in Wolfeboro, N. H., after a long illness. Mr. Goldthwaite started in the city engineering department fifteen years ago as a clerk. Ten years later he was appointed assistant city engineer and on the death of William L. Vannard was elected to fill the vacancy. He was 57 years old.

SEÑOR DON LUIS RISO PATRON, a distinguished topographic engineer and geographer, who served as Chilean member of the special commission on boundaries in the Tacna-Arica arbitration until the completion of the work of that commission in June, 1929, died recently in Santiago, Chile, according to word received by mail from that city. Señor Riso Patron was one of the world's leading authorities in his specialized lines, among other honors awarded to him being the annual gold medal of the American Geographic Society (of New York City) about four years ago.

JAMES MACKIN, for the past 32 years in charge of the sewage-treatment plant at Madison, Wis., died suddenly of a heart attack on the night of July 25 at his home in Madison. Although Mr. Mackin had been subject to heart attacks for some years, his health just previous to his death had been considered excellent. During the years of his service at Madison he had played a large part in the development of that city's sewage-treatment processes, from the earliest installation of sand filters to the present time. Mr. Mackin was 65 years of age. His son, John, is at present superintendent of the sewage plant at Aurora, Ill.

Construction Equipment and Materials

Court Upholds Welding Patent

Control of a new process connected with the electric welding of steel pipe has been won by the Republic Steel Corp. in a verdict handed down in the U. S. District Court in Brooklyn, N. Y. At the same time the court reaffirmed the validity of the Johnston process for continuous electric welding owned by the company. The case was a patent suit brought by Steel & Tubes, Inc., a subsidiary of the Republic Steel Corp., against S. Jackson Tube Co., Inc., of Brooklyn. The case involved not only the Johnston product and process patents but also the patent on an apparatus for smoothing out the weld of tubing made in continuous welding machines, which was invented by Harry Belmont, an employee of the Republic Steel Corp. Federal Judge C. G. Galston held the Belmont patent valid and infringed.

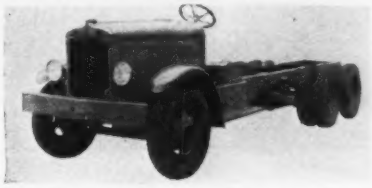
New Developments

Safeguards Protect Tractor From Accidental Injury

Although developed primarily for use in the logging industry, a number of accessories used on the Cletrac 80-60 logging special tractor for the protection of the machine itself should prove of interest to contractors working under unusually difficult conditions. Among the special devices included on this model are a radiator guard, a crankcase guard, a front bumper and pull hook, a spark arrester for the prevention of fire, a track wheel guard and instrument panel protection.

Suspension Drive Principle Used in Six-Wheel Truck

Two models of six-wheel truck chassis are being produced by the Relay Motors Corp., Lima, Ohio, in which the Relay type of pendulum suspension drive, by means of which the weight of the body and load is used to aid in traction, is utilized. The engine on both models is of the six-cylinder, removable L-head type. Bore and stroke dimensions are $3\frac{1}{4}$x5 and $4\frac{1}{8}$x$5\frac{1}{8}$ in., respectively, with power ratings of 33.75 and 40.8 hp. Three point suspension is used, with force-feed lubrication. Transmissions are of the selective gear type with five speeds forward and two reverse. A pad is provided for power take-off. On each model there are two complete sets of brakes: the service brakes of the Lockheed hydraulic type, internal expanding, operating on all six wheels, with a hand brake of external contracting type on the propeller shaft. The six-wheeler uses a single spring on both rear axles, only one end of which is directly connected



SIX-WHEEL TRUCK CHASSIS

to the frame. The other end is attached to the trailer axle by means of an oscillating rocker arm construction which permits it to work as a cantilever spring.

Steel Erection Facilitated by Heavy Portable Drill

Drilling, reaming or countersinking of heavy steel sections is facilitated by a new type of machine perfected by the Guibert Steel Co., Pittsburgh, Pa., known as the Togglebug. The name is derived from the fact that pressure on the drill point is applied and controlled by means of a powerful toggle connected with the handle. The machine is mounted on a body or carriage with a gross weight of 1,355 lb., which can be reduced to 432 lb. by stripping weights and counterweights. Thus it can be transported by a crane, rolled along on its roller or, when lightened, carried by three men.

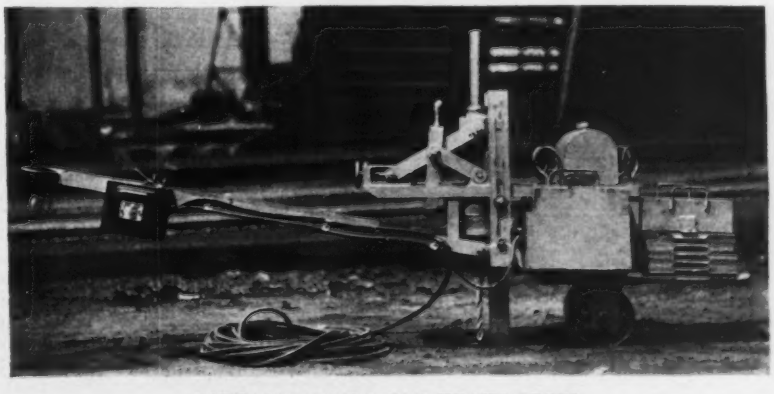
Power is furnished by a 2-hp. ball-bearing electric motor geared to a sliding spindle or toolholder in which the drill bit is held by a standard tapered socket. Cooling fluid is applied at the drill point from a tank mounted on the machine. A simple system of weights and counterweights give the Togglebug the necessary weight required for drilling large holes. The load is so balanced that the machine can be moved along with one hand on two rollers equipped with roller bearings. When in use the operator, by sitting or leaning on the end of the 5-ft. handle, exerts tremendous pressure on the drill point. The frame, in addition to the rollers, rests on adjustable legs, which permits drilling a vertical hole in materials of different thickness, and also permits getting the drill close to flanges in webs of large beams and H-sections. An extension is supplied for lengthening the rollers so that they ride the edges of the flanges when it is necessary to drill the webs of H-sections. A special attachment is also furnished for use in reaming chords of bridges.

All gears and bearings through which the power is applied are incased in oilproof housings and run in oil or grease.

Meter-Testing Scale Modified to Meet A.W.W.A. Specifications

Most water plants test their meters on factory-made meter-testing machines of the weighing type equipped with special percentage beams which dispense with the calculation of percentage. Various weights have been devised to hang on the end of the beam so that the percentages can be read directly on weights of from 1 to 10 cu.ft. and from 10 to 100 gal. The graduations on the percentage beam have been spaced so that the percentage of inaccuracy has been based on the amount of water registered by the meter.

However, standard specifications for cold-water meters adopted by the American Water Works Association and the New England Water Works Association now require that the percentage of inaccuracy be based on the amount of water passed through the meter instead of on the registration. Thus, a meter registering 10 per cent slow on the basis of water actually passed is registering 91.1 per cent on the basis of meter registration. Conforming to these specifications, the H. W. Clark Co., Mattoon, Ill., has designed a new scale beam correspond-

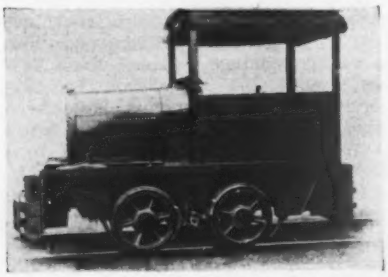


PORTABLE DRILL FOR HEAVY STEEL

ing to the specifications which also eliminates all the loose weights which were formerly hung on the end of the beam. This is equipped with an electric alarm buzzer which signifies the closing of the test. The sensitivity of the scale has also been increased considerably so that when the scale is balanced with 100 gal. of water, the addition of ¼ pint to the tank provides sufficient weight to throw the beam out of balance.

Automotive Power Plant Drives Light Locomotives

Two new series of gasoline locomotives in various gages with weights of from 2 to 4 tons are now being built by the Brookville Locomotive Co., Brookville, Pa., utilizing the power plant and four-speed transmission of the Ford model AA truck. Connection with a Brookville reverse drive makes all four speeds available in either direction. Maximum traction is provided by four-wheel drive through oversize roller chain. The manufacturer states



LOCOMOTIVE DRIVEN BY TRUCK MOTOR

that in low gear this motor, which develops 40 hp. at 2,200 r.p.m., is sufficiently powerful to slip all four drive wheels of a 4-ton locomotive operating on a dry sanded rail with steel tires. The steel tires, which are replaceable, are said to provide 25 per cent more traction than ordinary chilled face drivers. In high gear the same locomotive will attain a speed of 15 miles per hour. Freedom from derailment on light trackage is secured by the use of Brookville spring journals and wide wheels with deep flanges.

Bypass Openings Reduced in Traveling Water Screen

In a new model of traveling water screen developed by the Link-Belt Co., Chicago, Ill., particular stress has been laid on the construction of the screening trays and baskets for elevating the trash, which now have approximately 10 per cent greater depth of effective screening area than before. Heavy angle-iron one-piece frames are used, these being extremely rigid to withstand the high pressures encountered. Another feature of the screen is the overlapping of the trays and the use of seal plates to prevent the passing of trash around and

TRAVELING SCREEN INSTALLATION

between the screen panels. This overlapping feature is not affected by chain wear. The screen is driven by an electric motor with moisture-proof windings; a herringbone-gear speed reducer, running in oil and equipped with antifriction bearings; and a suitably guarded finished-steel roller chain drive to the screen headshafts. As in all screens of this type, the surfaces are automatically cleaned by sprays of water, which can be placed either on the ascending or descending run, according to individual requirements.

New Publications

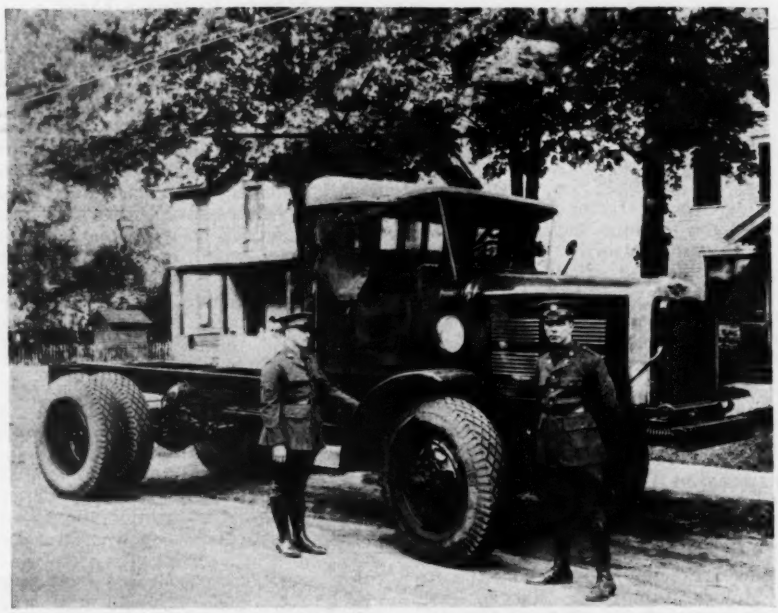
Electric Tools—Little Giant electric tools for many diversified purposes, varying from small drills weighing 6¾ lb. to heavy reamers weighing 96 lb., are described in a new catalog, No. 898, issued by the CHICAGO PNEUMATIC TOOL CO., 6 East 44th St., New York City. This company has also published a 12-p. bulletin, No. 865, on pneumatic demolition tools and sheeting drivers.

Air Compressors—Two descriptive catalogs issued by the WESTINGHOUSE TRACTION BRAKE CO., Pittsburgh, Pa., describe motor-driven air compressors of various types.

Cast-Iron Pipe—The eighth edition of the American Pipe Manual is now being distributed by the AMERICAN CAST IRON PIPE CO., Birmingham, Ala.

Sludge Pumps—Advantages of the Barnes plunger sludge pumps, and details of design, are given in bulletin 21W of the BARNES MFG. CO., Mansfield, Ohio.

WILLIAM DUDLEY FOULKE, for many years treasurer of the Western Wheeled Scraper Co., Aurora, Ill., died on July 2[illegible] at the age of 62. Mr. Foulke was well known to most of the earthmoving contractors in the United States. He had been connected with the Western Wheeled Scraper Co. for 36 years.



FIVE-TON ARMY TRUCK DRIVES THROUGH FOUR WHEELS

One of 24 heavy-duty 5-ton trucks recently delivered to the U.S. Army by the Four Wheel Drive Auto Co., Clintonville, Wis. The power plant for this model is a six-cylinder motor, 5x5¾ in., with a piston displacement of 677 cu.in., which develops 127 brake-horsepower. The four-speed transmission drives through a planetary step-down gear, a subtransmission and front and rear axles of the double reduction type to the four wheels. This arrangement gives eight speeds forward and two in reverse. The center differential, mounted on ball bearings, is driven by a 12-in. silent chain running in oil. Easy steering is given by a ball-and-socket steering assembly, so constructed that the entire front axle load is carried on four tapered roller bearings. Four-wheel hydraulic, internally expanding, fully inclosed brakes, supplemented by a powerful booster, make up the service brake system. The hand brake, transmission mounted, acts on all four wheels. The chassis weight of this unit is 10,000 lb. It has a wheelbase of 165 in. and a tread of 72 in., and is mounted on 44x10-in. pneumatic tires.

The Business Side of Construction

Public Construction Strong; Total Shows Drop From Last Year

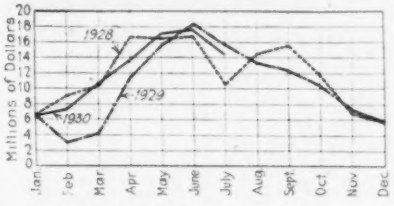
New England the Only Section of the Country to Maintain the Rate Set in 1929

JULY engineering construction contracts totaled $263,457,000, compared with $302,180,000 in June and $306,104,000 in July, 1929. The rate per week was 52.6 millions, compared with 75.5 in June and 76.5 a year ago.

The public works factor, which over a period of years averages 40 per cent of total engineering construction, was 53 per cent in July, compared with 43.6 in June and 45.6 in July, 1929. For the seven months of this year the proportion of public works to total was 41.3, compared with 31.2 in 1929 and 37 in 1928, and the total is 10 per cent above that of 1929 and 16 per cent above that of 1928.

Total engineering construction for the seven months is $2,114,000,000, a drop of 17 per cent from last year but an increase of 4 per cent over 1928. New England is the only section of the country that has maintained last year's construction rate. Next in line are the Middle Atlantic states, 7 per cent below. The most severe drop is in the Middle West, 42 per cent. In the region between the Mississippi River and the Rocky Mountains the drop is 23 per cent and in the Far West 20 per cent.

The construction standing of the various sections of the country, as per cent to total, are given in the table at the top of this column.



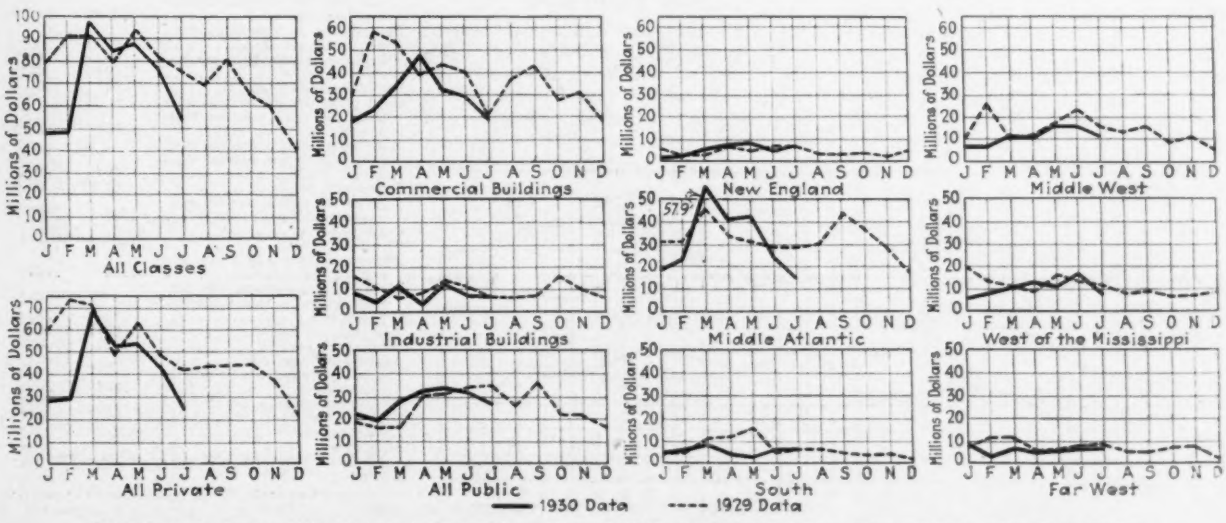
STREET AND ROAD CONTRACTS
Contract letting started early this year, as in 1928, and has remained above 1929 except for the slight drop last month. The increase of 21 per cent over the seven months of 1929 agrees closely with the 28 per cent increase budgeted by the states.

CONSTRUCTION IN EACH SECTION AS PER CENT OF TOTAL UNITED STATES FOR SAME PERIOD

	July		Seven Months		
	1930	1929	1930	1929	1928
New England	12	8	7	6	7
Middle Atlantic	28	38	44	39	38
South	10	8	8	9	7
Middle West	20	21	16	20	24
Miss. to Mountains	17	15	15	16	15
Far West	13	10	10	10	9
United States	100	100	100	100	100

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN JULY, 1930
Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States July, 1930	United States Seven Months 1930	United States Seven Months 1929	Canada, July, 1930
Water-works	721	1,672	123	899	463	307	4,185	29,976	25,851	103
Sewers	830	1,646	2,030	1,587	529	1,667	8,289	48,567	53,343	426
Bridges, public	298	3,830	520	2,701	1,504	1,977	10,730	66,049	53,357	25
Excavation	135	354	125	493	696	.....	1,803	12,747	18,780	802
Streets and roads	4,991	17,458	11,827	14,840	13,719	10,215	73,050	386,817	320,342	3,123
Federal government	1,410	3,505	5,863	492	1,605	1,548	14,423	66,806	69,493	.....
Unclassified, public	372	902	42	973	687	772	3,748	74,432	65,923	4,172
Buildings, public	6,622	3,654	1,863	6,195	2,883	1,804	23,021	186,310	186,035	1,034
Total public	15,379	33,021	22,393	28,180	21,986	18,290	139,249	871,704	794,874	9,685
Buildings, industrial	1,905	7,321	2,371	16,906	3,709	6,187	38,399	238,881	339,775	600
Buildings, commercial	13,660	31,235	1,894	5,395	8,645	7,776	68,605	674,570	1,084,974	1,533
Bridges, private	.....	16	750	18	1,245	650	2,679	9,001	28,923	.....
Unclassified, private	395	1,782	271	2,894	8,673	510	14,525	320,124	300,233	2,305
Total private	15,960	40,354	5,286	25,213	22,272	15,123	124,208	1,242,576	1,751,155	4,438
JULY TOTAL, 5 weeks	**31,339**	**73,375**	**27,679**	**53,393**	**44,258**	**33,413**	**263,457**	.....	.....	**14,123**
June, 1930, 4 weeks	15,641	97,999	30,919	61,023	70,896	25,702	302,180	.....	.....	13,318
July, 1929, 4 weeks	24,135	119,148	23,589	64,557	44,993	29,682	306,104	.....	.....	28,312
7 months, 1930	152,363	925,739	171,397	342,562	321,351	200,868	.....	2,114,280	.....	101,234
7 months, 1929	150,897	994,473	240,582	503,407	407,070	249,600	.....	.....	2,546,029	122,610



CONTRACTS AWARDED—NOTE INDUSTRIAL BUILDINGS, NEW ENGLAND, THE SOUTH, THE FAR WEST

Current Financing

New capital issued in June compares favorably with the volume for that month in the last few years. New corporation capital totaled 420 millions; for June of 1929-27: 408, 507 and 479; average 465. Public bonds sold totaled 147 millions, compared with 150, 121 and 155 for the three years, average 142 millions. The figures for May were 834 corporate, and 142 public.

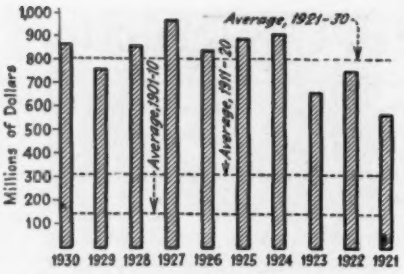
The largest items were public utilities, $163,000,000, and the railroads, $121,000,000. Next in order were oil and manufacturing. Each of these four items exceeded the values for June, 1929. Among the railroads issuing bonds in June for capital improvements were Boston & Albany, Colorado & Southern, Gulf, Mobile & Northern, and Old Colony. Utility construction plans include Commonwealth Water (N. J.); Federal Public Service; Queensboro Gas & Electric; United Light & Power (Kan.). The largest offering of stock was $38,305,600, Chesapeake & Ohio common, to stockholders.

For the half year net corporation capital totaled 3,374 millions; for 1929-27: 2,918, 2,179 and 2,456; average 2,518. Public bond sales totaled 743 millions, compared with 663, 750 and 862 for the three years; average 758.

Cost of Money

Interest rates on first mortgages are 5½ to 6 per cent, as they were before the stock-market drop in the latter part of 1929, while second mortgages cost 7 per cent, with additional fees. Before the drop, money was diverted from mortgages to speculation; afterward, lenders were not eager to put money into what they called the "overbuilt construction market." Consequently rates have remained stationary despite the talk of low money. Yields on fifteen private bond issues for buildings in June varied from 5 to 7 per cent, averaging 6.2.

According to the Public Service & Engineering Co., subsidiary of Stone & Webster, desirable building projects rate 5½ per cent, but 6 is the figure on most firsts. The Lawyers Title & Guarantee Co., New York, accepts no mortgages under 6 per cent, believing that there is a surplus of buildings except for special purposes. Banks in outlying towns are said to be loaded down with



PUBLIC BOND SALES OF LAST TEN YEARS

Long-term public bond sales in July totaled 105 millions, the smallest figure since February but the largest July since 1925. The seven months' total is 865 millions, compared with 755 in 1929 and 859 in 1928. For the ten years 1921-30, the average was 806 millions for the first seven months; for 1911-20, it was 310; for 1901-10, it was 144.

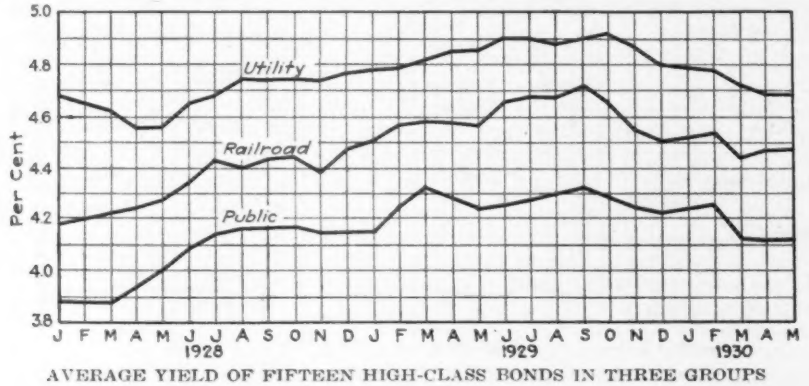
properties acquired through foreclosure, and building and loan associations have long lists of properties on which purchasers are unable to continue payment.

Yields on June offerings of public bonds averaged 4.62½ for the 173 issues sold. The highest yield was 6 per cent on four small lots totaling only $76,000. Six issues totaling only $1,095,000 gave less than 4 per cent: five in Massachusetts, one in Pennsylvania. Eleven utility issues ranged from 4.9 to 6.5, arithmetical average 5.56; twelve railroads, 4 to 5.04, average 4.46. In the utilities field 85 important issues worth $930,000,000 have been sold in the seven months of this year. Yields ranged from 4.56 to 7.21 per cent, with twelve under 5 per cent and twenty-seven 6 per cent or more. The number of these issues per month varied from eight to fourteen, with twelve the average, and the weighted averages of the yields for each month's issues were: January, 5.64 per cent; February, 5.84; March, 5.81; April, 5.04; May, 5.43; June, 5.28; July, 5.11.

Construction Materials in the New Tariff Law

The Fordney-McCumber tariff act of 1922 mentioned 50 construction material items, of which eight—brick, cement, hewn timber, sawed lumber, most logs, flooring, shingles and lath, and asphalt and road oils—were on the free list. The Smoot-Hawley act of 1930 (effective June 18) lists these same 50 materials, raising rates on twelve, with no downward revisions. Table I lists these twelve first, the 38 others following.

Half of the items on which rates were advanced or were levied for the first time are in the clay and mineral classifications, being brick, tile, cement, granite, slate, and travertine. Most of the lumber items now have a flat rate



AVERAGE YIELD OF FIFTEEN HIGH-CLASS BONDS IN THREE GROUPS

TABLE I—CONSTRUCTION MATERIALS LISTED IN NEW TARIFF

Material	Act of 1930	Act of 1922
Brick, com., front or paving, per M	$1.25	Free
Tile, per sq.ft.	.10*	$0.08†
Cement, per 100 lb.	.06	Free
or per bbl. of 4 bags	.2256	Free
Granite, paving or bldg., infd., ad val.	60%	50%
Travertine, per cu.ft.	.25	.15
Slate, roofing, ad val.	25%	15%
Cast-iron pipe and ftgs., ad. val.	25%	20%
Timber, hewn, per M. ft. (fir, spruce, hemlock, pine and larch)	1.00	Free
Lumber, sawed, per M ft. (fir, spruce, hemlock, pine and larch)	1.00	Free
Flooring, maple, birch and beech, ad val.	8%	Free
Window glass, per lb. (not exceeding 150 sq.in.)	.01875	.0125
Linseed oil, per lb.	.045	.033
Crushed limestone, per 100 lb.	.05	.05
Lime, common, per 100 lb.	.10	.10
Lime, hydrated, per 100 lb.	.12	.12
Cement, white, non-stain, per 100 lb.	.08	.08
Cement, Keene's, gypsum, per ton (valued at $14 per ton or under)	3.50	3.50
Gypsum or plaster rock, ground, per ton	1.40	1.40
Limestone, infd., ad val.	50%	50%
Sandstone, infd., ad val.	50%	50%
Marble block, rough or squared, per cu.ft.	.65	.65
Marble slabs and tiles, per superficial ft. (not less than 4 superficial inches, if not more than 1 in. thick)	.08	.08
Mosaic cubes, marble, loose, per lb. (not exceeding 2 cu.in. in size), per cent ad val.	.0025-20%	.0025-20%
Mosaic cubes, attached to paper or other material, per superficial ft.	.05-35% ad val.	.05-35% ad val.
Steel beams and other shapes, per lb. (not assembled)	.002	.002
Steel plates, per lb. (not thinner than .109 in., value not above 3c. per lb.)	.005	.005
Rein. bars, per lb. (valued above 1½c. and not above 2½c. per lb.)	.005	.005
Steel sashes and frames, ad val.	25%	25%
Steel sheet piling, per lb.	.002	.002
Wire rope and strand, ad val.	35%	35%
Steel sheets, black, per lb. (thinner than .109 in. and not thinner than .038 in.)	.0045	.0045
Steel sheets, as foregoing, galv., per lb.	.0065	.0065
Fish plates or splice bars, per lb.	.0025	.0025
Tie plates, per lb.	.0025	.0025
Tin or terne plate, per lb.	.01	.01
Steel pipe, per lb. (not thinner than .065 in. if not less than ¾ in. dia.)	.0075	.0075
Wire nails, per lb. (not less than 1 in. length nor smaller than .065 in. dia.)	.004	.004
Steel rivets, per lb.	.01	.01
Logs of fir, cedar, spruce or western hemlock, per M ft.	1.00	1.00
Other logs	Free	Free
Shingles and lath	Free	Free
Plate glass, per sq.ft. (not exceeding 384 sq.in.)	1.25	.125
Plate glass, containing wire netting, per sq.ft. (not exceeding 384 sq.in.)	.15	.15
Red lead, per lb.	.0275	.0275
White lead, per lb.	.025	.025
Asphalt and road oils	Free	Free
Pleaching powder, per lb. (chlorinated lime)	.003	.003
Aluminum sulphate, per lb.	.0075	.0075
Soda ash, per lb.	.0025	.0025
Dynamite, per lb.	.0125	.0125

*But not less than 50 nor more than 70% ad-valorem.

†But not less than 45 nor more than 60% ad-valorem.

of $1 per 1,000 ft., leaving logs, except fir, cedar, spruce and Western hemlock, and shingles and lath on the free list. Cast-iron pipe is raised five points ad valorem, to 25 per cent. Rates on window glass and linseed oil were increased ⅝c. per pound and 1.2c. per pound, respectively.

Principal foreign competition is as follows: brick, cement, window glass, Belgium; travertine, Italy; tile, Germany, United Kingdom, Belgium, Austria; lumber, Russia and central Europe; cast-iron pipe, France; linseed oil, Argentina.

Producers and manufacturers of these materials assert that the upward revision will benefit their industries, permitting them to concentrate on home competition. Brickmakers state that the new tariff has eliminated Belgian competition. Cement mills of the Birmingham district, practically closed for some months, are opening.

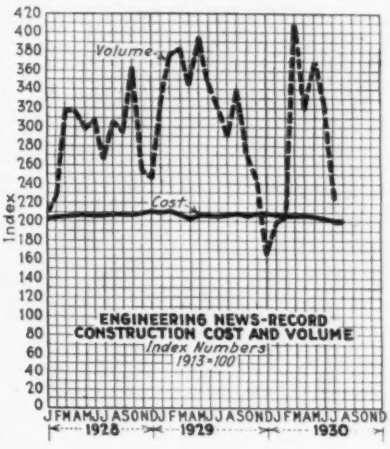
Materials and Labor

With building volume below normal this year, materials have moved more slowly than in 1929. Cement and steel, however, excellent indicators of conditions in the field of general construction, report movements very close to those of last year. Shipments of cement for the first six months of 1930 totaled 70,123,000 bbl., compared with 70,248,000 in 1929. Fabricated structural steel shipments totaled 1,712,000 tons, compared with 1,694,000 in 1929, and the heaviest awards were in the third week of July, amounting to 58,000 tons.

Unemployment in the building trades remains at 37 per cent, as in May and June, compared with 16 and 24 per cent in July and June, 1929. The American Federation of Labor weighted figure for general urban unemployment exclusive of office workers is 16.3 for July, 14.2 for June.

Construction Cost and Volume Index Numbers

Costs remain the same as last month, there having been no major changes in material prices nor in labor rates. The volume index is 226, a drop of 30 per cent from June and 29 per cent from July, 1929.


Volume
Cost
Index
ENGINEERING NEWS-RECORD
CONSTRUCTION COST AND VOLUME
Index Numbers
1913=100
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1928
1929
1930

E. N.-R. Cost		E. N.-R. Volume*	
August, 1930	**200.95**	**July, 1930**	**226**
July, 1930	200.95	June, 1930	324
August, 1929	205.91	July, 1929	320
Peak, June, 1930	273.80	1929 (average)	317
1929 (average)	207.02	1928 (average)	287
1913 (average)	100.00		
1929		1929	
January	209.40	January	325
February	210.40	February	378
March	207.78	March	382
April	203.40	April	332
May	205.15	May	395
June	205.65	June	347
July	204.77	July	320
August	205.91	August	290
September	207.57	September	340
October	206.32	October	273
November	208.46	November	245
December	209.46	December	166
1930		1930	
January	208.96	January	199
February	206.46	February	204
March	206.80	March	408
April	207.12	April	320
May	205.86	May	354
June	203.36	June	324
July	200.95	July	226
August	200.95		

*Corrected for price change since 1913.

Local price changes and labor conditions are noted below.

Birmingham—Cement mills which have practically been closed for some months are opening again, due, it is said, to the tariff. Coal mines also are opening, giving employment to several hundred miners heretofore idle. Steel mills of the Tennessee Coal, Iron & Railroad Co. have opened after several weeks' shutdown, and 800 men have returned to work. The pipe shop at Holt, Ala., has resumed operations with 800 men.

Boston—Serious unemployment in all lines, slightly worse than a month ago.

Chicago—Steel prices were reduced 10c. on both structural shapes and plates, to $3 warehouse. Wire nails have been reduced from $2.75@$2.85 to $2.30@$2.50. Sand, gravel and crushed stone prices have been advanced 10c., to $2. Douglas fir timbers 3x4 to 14x14 have been dropped in price $1.50 per 1,000 ft. b.m. Unemployment, according to labor leaders, is the worst in years.

Cleveland—Steel sheet prices reduced 25c. for blue annealed and 15c. for black and galvanized. Sand, gravel and crushed stone down 10c., to $2.60 per cubic yard. Lumber prices much lower.

Dallas—Reinforcing bars down 5c., to $2.85. Structural steel down 10c., to $3.75. No. 10 blue annealed sheets sell for $5; prices on galvanized only on request. Sand and gravel up to $3. Fir and hemlock timbers down $2.50, to $52.50. Unemployment.

Detroit—Building supply dealers report material business half that of a year ago, with yards being closed to save expense. Unemployment increased in July.

Minneapolis—Only price changes: linseed oil now 15.3c., was 15.8c.; manila rope down 1c., to 21c. Lumber stocks are below normal and broken, with demand light. Linseed likely to go higher. Unemployment bad as last month.

New York—Shapes and plates down 20c., to $3.10 for 2 tons or less from warehouse. Wrought-steel pipe prices decreased slightly, as there is small demand for water, gas and steam sizes for roughing in. Linseed oil is down 2c. per pound, to 14.6c., a small drop, as seasonal buying is over.

St. Louis—Price of railway ties down 5c. for 6x8-in. white oak untreated, and 10c. for 7x9-in.; red oak untreated down 5c. for 6x8-in. and up 10c. for 7x9-in.; red oak plain now 93c. and $1.50 each. Wire nails down 10c., to $2.75. Lumber prices have advanced generally. Little change in labor situation, with 9,000 building mechanics idle, compared with 3,000 a year ago. Construction outlook improved, with several large projects scheduled to start within the month; general improvement expected Sept. 1.

Seattle—Prices of sand, gravel and crushed stone continue $1.75 per cubic yard and $1.25 at bunkers. Finishing hydrated lime is down $1, to $35 per ton. Asphaltum costs $21.40 at plant and $23.40 delivered. Manila rope down 1c., to 19.5c.

Unemployment in Seattle and the Northwest is severe and increasing, with 50,000 loggers and lumbermen wholly unemployed in Oregon, Washington and Idaho.

CURRENT BUILDING AND CONSTRUCTION TRADES WAGE RATES PER HOUR

Advances since last month are indicated by **heavy type**, declines by *italics*

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor*
Atlanta	$1.25@1.40	$0.60@.70	$0.60@1.00	$0.50	.....	$0.75@1.25	$0.25@.35
Baltimore	1.75	1.00@1.10	1.00@1.37½	1.00	$0.65	1.00@1.25	.35
Birmingham	1.50	1.00	1.25	.50	.....	1.25	.20@.35
Boston	1.50	1.37½	1.37½	.85	1.27½	1.37½	.45@.80
Cincinnati	1.62½	1.40	1.40	1.00	1.40	1.40	.40@.60
Chicago	1.70	1.62½	1.62½	.97½	1.62½	1.62½	.97½
Cleveland	1.62½	1.37½	1.37½	.87½	1.10	1.50	.40@.87½
Dallas	1.87½	1.12½	1.25	.35 @ .75	1.25	1.37½	.35@.50
Denver	1.50@1.62½	1.25	1.25@1.37½	.87½@1.00	.....	1.25	.62½
Detroit	1.56½	1.00@1.25	1.00@1.10	.90	1.00@1.10	1.00@1.25	.50@.60
Kansas City	1.50	1.25@1.37½	1.25	.90	1.37½	1.37½	.95@.75
Los Angeles	1.37½	1.00	1.00	.75	.87½	1.00	.50
Minneapolis	1.30	.90	.90@1.00	.80	.....	1.00@1.25	.50@.65
Montreal	1.25	.80	.75	.....	.90	1.00	.30@.35
New Orleans	1.50	.90	1.25	.75	.80@1.00	1.25	.30@.40
New York	1.87½	1.65	1.92½	1.18¾	1.10@1.23¾	1.92½	1.03¾
Philadelphia	1.75	1.50	1.02½	.70@1.12½	1.00	1.37½@1.50	.40@.50
Pittsburgh	1.75	1.50	1.43¾@1.56¼	1.12½	.....	1.50	.40@.80
St. Louis	1.75	1.50	1.60@1.75	1.15@1.25	1.50	1.75	.40@.87½
San Francisco	1.37½	1.12½	1.12½	.87½	1.12½	1.37½	.68¾
Seattle	1.50	1.12½	1.12½@1.25	1.00	1.12½	1.25	.70
Average	1.56	1.18	1.24	0.88	1.13	1.30	0.52½

*Minimum rates are non-union and for construction other than buildings.

Current Prices of Construction Materials

Price advances since last month are indicated by **heavy type;** declines by *italics*

Building Materials

PORTLAND CEMENT—Prices per barrel, *without charge for bags*, cash discount not deducted. Prices marked f.o.b. are manufacturers'; others are delivered by truck to contractors:

	Aug. 6, 1930	One Mo. Ago	One Yr. Ago
Atlanta	$2.49	$2.49	$2.10
Baltimore	2.60	2.60	2.65
Birmingham	2.60	2.60	2.60
Boston	*2.50*	2.50	2.25@2.35
Dallas	2.15	2.15	2.15
Denver	2.61	2.61	2.55
Jersey City	2.60	2.60	2.63
Kansas City	2.50	2.40	2.55
Los Angeles	1.92	1.92	2.86
Montreal	2.20	2.20	1.70
New Orleans	2.65	2.65	2.65
New York	2.10	2.10	2.25
Philadelphia	2.10	2.10	2.40
St. Louis	2.45	2.45	2.45
San Francisco	2.64	2.64	2.41
Seattle	....	2.70	....
(F.O.B.)			
Cedar Rapids	2.23	2.23	2.24
Chicago	1.95	1.95	2.05
Cincinnati	2.14	2.14	2.17
Cleveland	2.04	2.04	2.04
Davenport	2.14	2.14	2.24
Detroit	1.95	1.95	1.95
Duluth	2.04	2.04	2.04
Indianapolis	1.99	1.99	2.09
Milwaukee	2.10	2.10	2.20
Minneapolis	2.27	2.27	2.22
Peoria	2.12	2.12	2.22
Pittsburgh	1.95	1.95	2.05
St. Paul	2.27	2.27	2.22
Toledo	2.20	2.20	2.20

Current mill-prices per barrel, in carloads, without bags, f.o.b.:

Alpena, Mich	$1.65	Limedale, Ind	1.70
Buffington, Ind	1.70	Mason City, Ia	1.85
Chinchfield, Ga	**2.10**	Norfolk, Va	1.90
Hannibal, Mo	1.80	North Birmingham, Ala	1.70
Houston, Tex	1.95	Richard City, Tenn	2.05
Hudson, N. Y	1.85	Steelton, Minn	1.85
Ironton, Ohio	1.75	Universal, Pa	1.70
Iola, Kan	1.85	Waco Tax	1.75
La Salle, Ill	1.60	Wyandotte, Mich	1.70
Northampton, Pa	$1.75		

SAND AND GRAVEL—Per ton, delivered by dealers. Weight of sand per cu.yd., 1½ tons; gravel, 1½ tons, unless otherwise specified in pounds:

	Gravel		Sand
	1½ In.	¾ In.	
Atlanta	$2.60	$2.60	$2.15
Baltimore, per cu.yd	2.40	2.60	1.70
Birmingham, per cu.yd., 2,600 lb	3.50	3.50	3.00
Boston	*1.75*	*1.75*	*1.15*
Chicago, per cu.yd	**2.00**	**2.00**	**2.00**
Cincinnati	1.75	1.75	1.50
Cleveland, per cu.yd., 3,000 lb	*2.60*	*2.60*	2.50
Dallas, per cu.yd., 2,700 lb	**3.00**	**3.00**	**3.00**
Denver, per cu.yd., 2,700 lb	1.95	1.95	1.35
Detroit	2.50	1.85	1.65
Kansas City	....	....	0.60*
Los Angeles	1.40	1.40	1.00
Minneapolis, per cu.yd., 2,800 lb	2.40	2.40	1.10
Montreal	1.25	1.25	1.25
New Orleans, per cu.yd., 2,700 lb	3.75	3.75	2.75
New York, per cu.yd	3.40	3.40	2.15
Philadelphia	2.30@3.15	2.30@3.15	1.50@2.31
Pittsburgh	1.45@2.40	1.45@2.40	1.65@2.60
St. Louis	1.55	1.55	1.65
San Francisco	1.75	1.75	1.75
Seattle, per cu.yd., 3,200 lb	1.75	1.75	1.75

* t plant; 4c. off for 10 days payment.

Note: New York gravel weighs 2,800@3,000 lb. and sand, 2,700 lb. per cu.yd.

CRUSHED STONE—Per ton, delivered by dealers. Weight per cu.yd., 1½ tons, unless otherwise specified in pounds:

	1½ In.	¾ In.
Atlanta	$2.60	$2.60
Baltimore, per cu.yd	2.75	2.85
Birmingham, limestone, per cu.yd	3.00	3.25
Boston	*2.00*	*2.00*
Chicago, limestone, per cu.yd., 2,500 lb	**2.00**	**2.00**
Cincinnati	2.25	2.25
Cleveland	*2.60*	*2.60*
Dallas, per cu.yd., 2,500 lb	3.25	3.45
Denver, granite, per cu.yd., 2,700 lb	2.50	2.50
Detroit, limestone	2.25	2.25
Kansas City	2.00	2.00
Los Angeles	1.50	1.50
Minneapolis, limestone, per cu.yd., 2,600 lb	2.40	2.40
Montreal	1.90	2.10
New York, limestone, per cu.yd	3.40	3.40
Philadelphia, limestone	2.30@3.15	2.30@3.15
Pittsburgh	2.75	2.75
St. Louis	1.75	1.75
San Francisco, trap rock	1.65	1.65
Seattle, per cu.yd., 2,700 lb	1.90	1.90

CRUSHED SLAG—Manufacturers' quotation on crushed slag in carloads, per net ton, at plant:

	1½-In.	¾-In.	Roofing	Sand
Birmingham, Ala	$0.90	$1.15	$2.05	$0.55
Buffalo District	1.25	1.35	2.25	1.25
Cleveland, Ohio	*1.10*	*1.10*		1.30
Western Pennsylvania	1.25	1.25	2.00	1.25
Toledo, Ohio	1.25	1.25	1.50	1.25
Youngstown District	1.25	1.35	2.00	1.25

HOLLOW TILE—Building tile per block, delivered by dealers to contractors in lots of 2,000 pieces or over:

	4x12x12	6x12x12	8x12x12	10x12x12	12x12x12
Atlanta	$0.069	$0.091	$0.125	$0.137	$0.178
Baltimore	.105	.....	.20	.....	.26
Birmingham	.09	.127	.174	.218	.261
Boston	.08	.113	.155	.21	*.258*
Chicago	.076	.104	.142	.182	.202
Cincinnati	.06815	.09485	.129	.165	.184
Cleveland	.064	.088	.128	.171	.19
Dallas	.094	.112	.179	.....	.....
Denver	.0975	.135	.175	.2125	.25
Detroit	.098	.135	.184	.24	.265
Kansas City	.0525	.077	.184	.24	.265
Los Angeles	.085	.122	.175	.232	.285
Minneapolis	.0611	.081	.10605	.1302	.1737
Montreal	.12*	.....	.22†	.....	.....
New Orleans	.086	.118	.16	.212	.256
New York	.0864	.1296	.162	.....	.....
Perth Amboy, N. J.(f.o.b.)	.....	.....	.....	.2388	.2956
Philadelphia	.105	.14	.215	.28	.34
Pittsburgh	.068	.....	.1175	.....	.1726
St. Louis	.078	.104	.145	.175	.21
San Francisco	.108	.156	.255	.....	.....
Seattle	.085	.115	.18	.....	.....

*4x4x12. †8x8x12.

BRICK—Prices delivered by dealers per thousand, are as follows:

		Paving F.O.B.	
	Common	3x8½x4-In.	3½x8½x4-In.
Atlanta	$12.00	$36.00*	$42.00†
Baltimore	13.00	40.00	46.00
Birmingham	14.00	26.00*	31.00†
Boston	16.00	43.00	47.00
Chicago	12.00	42.00	45.00
Cincinnati	17.50	37.00	39.00
Cleveland	14@16	33.00	36.00
Dallas	**14.50**	29.00*	.....
Denver	11.00	.....	.....
Detroit	15.50	33.50	36.50
Kansas City	14.00	.....	.....
Los Angeles	*10.00*	.....	.....
Minneapolis	12.75	.....	.....
Montreal	20.00	.....	.....
New Orleans	16.50	38.00*	45.00
New York	13.00	45.00	50.00
Philadelphia	16.00	40.00	46.00
Pittsburgh	16.00	40.50	45.00
St. Louis	13.00	40.00	40.00
San Francisco	14.50	45.00*	.....
Seattle	14.00	50.00	55.00

*2.8x4 in. †3x8x4.

LIME—Prices delivered by dealers to job:

	Hydrated, per Ton		Lump, per Barrel	
	Finishing	Common	Finishing	Common
Atlanta	$21.00	$13.50	.....	.....
Baltimore	22.00	14.00	$2.55†	.....
Birmingham	22.00	16.00	3.00†	$2.00†
Boston	22.00	15.00	4.00*	3.15*
Chicago	17.00	14.50	15.00‡	15.00‡
Cincinnati	15.80	13.00	.....	.....
Cleveland	18.00	15.00	2.50†	2.50†
Dallas	20.00	.....	.....	18.00‡
Denver	32.00	23.75	3.80*	3.00*
Detroit	18.00	14.80	2.20†	2.00†
Kansas City	*22.00*	17.50	2.85†	2.50†
Los Angeles	18.90	16.00	2.85†	14.00‡
Minneapolis	25.50	21.00	.....	1.70†
Montreal	19.75	.....	.....	15.00‡
New Orleans	.....	.....	2.60†	1.60†
New York	21.00	13.00	4.10*	3.15*
Philadelphia	22.00	15.00	.....	.....
Pittsburgh	20.00	17.00	2.50†	.....
St. Louis	24.00	18.00	2.75†	15.00‡
San Francisco	20.00	20.00	.....	1.85†
Seattle, paper sacks	*35.00*	24.00	.....	2.80†

*Per 280-lb. bbl. (net). †Per 180-lb. (net). ‡Per ton.

CONCRETE BLOCKS—Manufacturers' quotations on standard, 8x8x16-in., hollow, delivered to job, each:

Boston	$0.18@$0.20	Kansas City	$0.16
Brooklyn and Queens	.12@ .14	New Orleans	.22
Cleveland	.16@ .17	Philadelphia	.18@.25
Denver	.22	Pittsburgh	.20
Detroit	.15	St. Louis	.17
Minneapolis	.11		

SLATE—Roofing, f.o.b., quarry, Bangor, Pa., net, per square:

No. 1 Clear	$9.00@$14.00
No. 1 Ribbon	*7.50*@ **10.25**
Medium Clear	*8.00*@ **10.50**

Road and Paving Materials

PAVING STONE—Carloads or cargo lots of granite blocks, 4x8x4-in. dressed, f.o.b.:

Atlanta	$3.00 per sq.yd.
Baltimore	3.00 per sq.yd.
Boston	135.00 per M.
Chicago, 5 in.	3.25@3.90 per sq.yd.
Cincinnati	110.00 per M.
Cleveland	115@120 per M.
Detroit, 5 in.	3.00 per sq.yd.
Kansas City	3.00 per sq.yd.
Minneapolis, 4½x8x5 in.	2.80 per sq.yd.
Montreal	104.75 per M.
New Orleans	2.80 per sq.yd.
New York, 5 in., Grade 1, 30 blocks per sq.yd	150.00 per M.
Philadelphia	125.00 per M.
St. Louis, 4x5x8 to 12 in.	3.50 per sq.yd.

Current Prices of Construction Materials

Road and Paving Materials—Continued

WOOD-BLOCK PAVING—Prices, f.o.b., in carloads:

	Size of Block	Treatment	Per Sq.Yd.
Atlanta	3½	16	$2.25
Boston	3½	16	2.25
Chicago	3½	12	2.10
Cincinnati	3½	16	2.35
Kansas City	3½	16	2.75
Minneapolis	3½	16	2.75
Montreal	4	16	4.50
New Orleans	3½	16	2.40
New York	3½	16	2.50
St. Louis	3½	16	2.40

FLAGGING—Alongside dock, New York: Manhattan and Bronx, 4 ft. wide, 24c. per sq.ft.; Queens, 5 ft. wide, 26c. per sq.ft.

CURBING—*New York*: Bluestone, f.o.b. barge, 5x16 in., rough, 90c. per lin.ft., cutting charges extra. *Birmingham*: Limestone, 5x18-in., f.o.b., $1.05 per lin.ft. *St. Louis*: Class "B" straight, 5x16-in., f.o.b., $1.00 per lin.ft.; roundings, $1.35 per lin.ft.

ASPHALT—Manufacturers' quotations per ton in packages (350-lb. bbls. or 425-lb. drums); also in tank-car lots, f.o.b. points listed:

	Package	Tank-car
Atlanta (Mexican)	$20.40	$16.40
Baltimore (Standard Oil, f.o.b. refinery)	21.75	17.75
Birmingham (Mexican)	27.00	23.00
Boston (Mexican)	23.50	18.00
Chicago (Texas)	23.50	19.30
Cincinnati (Kentucky Rock)	.....	12.30
Cleveland	24.00	20.00
Dallas (Texas)	24.40	.....
Denver (California)	35.00	.....
Detroit (Mexican) (Texas)	19.72	14.87
Kansas City, Mo. (Texas)	23.00	17.50
Los Angeles ("D" Grade, Calif., f.o.b., El Segundo)	18.00	12.00
Maurer, N. J. (Bermudez)	30.00	.....
Maurer, N. J. (Trinidad)	25.00	.....
Minneapolis, (Stanolind, f.o.b., Twin Cities)	23.00	19.10
Montreal (Imperial)	28.00	21.50
New Orleans (Texas)	24.00	21.00
New York (Texas)	22.50	18.50
Philadelphia (Mexican)	18.00	15.00
Pittsburgh (Standard Oil)	24@26	14@18
St. Louis (Venezuela)	*17.00*	*13.00*
San Francisco, (f.o.b. refinery, Oleum, Calif.)	18.00	12.00
Seattle (Standard Oil)	21.40	18.00

ROAD OILS—Manufacturers' quotations, f.o.b., in tank cars, 8,000 gal. minimum, per gal.:

Birmingham, 40@50% asphalt	$0.0525
Birmingham, 50@60% asphalt	.0525
Dallas, 40@50% asphalt	.055
Dallas, 50@60% asphalt	.055
New York, 40@50% asphalt, (at terminal)	.05
New York, 50@60% asphalt, (at terminal)	.05
St. Louis, 40@50% asphalt	.04
St. Louis, 50@60% asphalt	.04

Iron and Steel

PIG IRON—Producers' quotations, per gross ton, f.o.b.:

Birmingham, No. 2 fdry., silicon 1.75@2.25	$14.00
Pittsburgh, basic, incl. freight ($1.76) from Valley	19.63@20.13

STRUCTURAL STEEL—Manufacturers' and dealers' quotations per 100 lb.

	Shapes, 3 to 15-In.	Plates, ¼-In.
Birmingham, large mill lots, f.o.b.	$2.15	$2.15
Chicago, warehouse, delivered	*3.00*	*3.00*
Cleveland, warehouse, delivered	3.00	3.00
Dallas, warehouse, delivered	*3.75*	*3.75*
New York, warehouse, delivered, up to 3,999 lb.	*3.10*	*3.10*
Pittsburgh, large mill lots, f.o.b.	1.65	1.65
St. Louis, warehouse, delivered	3.25	3.25
San Francisco, warehouse, delivered	3.40	3.40

BARS, CONCRETE REINFORCING—Manufacturers' and dealers' quotations on bars rolled from billets, per 100 lb. for ¾-in.:

Birmingham, large mill lots, f.o.b.	$2.15
Chicago warehouse, delivered	2.15@3.00
Cleveland, warehouse, delivered	2.25@2.44
Dallas, warehouse, delivered	*2.85*
New York, warehouse, delivered, over 5 tons	2.70
Pittsburgh, large mill lots, stock lengths, f.o.b.	*1.60*
St. Louis, warehouse, delivered	3.15
San Francisco, warehouse, delivered	2.50

EXPANDED METAL LATH—Per 100 sq.yd., painted, delivered to job, in less-than-carload lots:

Lb. per Sq.Yd.	New York	Birmingham	Chicago	St. Louis	Dallas	San Francisco
2.2	$18.50	$22.00	$16.00	$18.00	$21.50	$21.50
2.5	19.50	23.00	17.00	19.00	24.00	22.50
3.0	21.00	25.00	18.50	20.50	25.50	25.00
3.4	22.00	26.50	19.50	21.50	30.00	27.00

WIRE REINFORCEMENT FOR CONCRETE—Manufacturers' quotations per 100 sq.ft. in carloads at mills; dealers, delivered', in lots of 10,000 sq.ft. or over; plain 4 in. by 4 in. mesh:

Style Number	Weight in Pounds per 100 sq.ft.	Pittsburgh Mill	Chicago District Mill	Warehouse Delivery: New York	St. Louis	Dallas	San Francisco
032½	22,	$0.99	$1.01	$1.39	$1.30	$1.13	$1.22
049	28	1.26	1.29	1.76	1.70	1.38	1.55
068	35	1.54	1.58	2.18	2.10	1.67	1.91
093	40	1.98	2.03	2.79	2.65	2.00	2.46
126	57	2.45	2.51	3.45	3.30	2.55	3.03
153	68	2.92	2.99	4.13	4.00	3.157	....
180	78	3.35	3.43	4.73	4.60	3.47	....

STEEL SHEETS—Manufacturers' and dealers' quotations per 100 lb. base:

	Blue Annealed No. 10*	Black No. 24	Galvanized No. 24
Chicago, warehouse, delivered	$3.35†	$4.05†	$4.60†
Cleveland, warehouse, delivered	*3.00*	*3.60*	*4.15*
New York, warehouse, delivered	3.40	3.65@3.90	4.25
Pittsburgh, large mill lots, f.o.b.	2.00	2.50@2.55	3.20
St. Louis, warehouse, delivered	3.45	4.25	4.85
San Francisco, warehouse, delivered	3.80	4.35	5.00

*Light plates. †400 lb. to 3,999 lb.

WIRE ROPE—Discounts from manufacturers' list price on regular grades of bright and galvanized, Eastern Territory, New York, and East of Missouri River.

	Base
Cast steel round strand rope	20%
Galvanized iron rigging and guy rope (add to list)	12½%
Galvanized steel rigging and guy rope	7½%
Plow steel round strand rope	35%
Round strand iron and iron tiller	5%
"Special Steel" and extra strong cast steel, round strand rope	27½%

Discount 5 points less than discount for Eastern territory: California, Oregon, Nevada, Washington, Wyoming, New Mexico, Colorado, North Dakota, Nebraska, Kansas, Oklahoma and Texas. Discount 10 points less than discount for Eastern territory: Arizona, Montana, Idaho and Utah.

RIVETS—Manufacturers' and dealers' quotations on structural rivets, round head, ½-in., full kegs, per 100 lb.:

Chicago, warehouse, delivered	$4.00
Dallas, warehouse, delivered	4.50
Denver	4.80
New York, warehouse, delivered	4.50*
Pittsburgh, large mill lots, f.o.b.	2.90
St. Louis, warehouse, delivered	4.15
San Francisco, warehouse, delivered	5.50
Seattle, warehouse, delivered	4.25

*This price is for full kegs; broken kegs are $6.00 per 100 lb.

STEEL SHEETPILING—The manufacturers' base price, f.o.b., Pittsburgh, for large mill lots is $2.25 per 100 lb.

TERNE PLATE—I C, 8-lb. coating, 20x28-in., f.o.b., Pittsburgh mill:

Per package	*$10.30*

SHIP SPIKES—Per 100 lb., black, from dealers' warehouse stocks; galvanized are about $1.75 per 100 lb. higher:

	½-In.	⅝-In.	¾-In.
San Francisco	$5.55	$5.10	$4.95
Seattle	7.75	5.65	5.50

Pittsburgh mill base in lots of 200 kegs or more, $3.00 per 100 lb.

WIRE NAILS—Per 100 lb. keg, base, delivered from warehouse stocks; also Pittsburgh mill base:

Pittsburgh Mill	Birmingham	Chicago	St. Louis	Dallas	San Francisco	Montreal
$2.30@$2.40	$3.30	*$2.30*	*$2.75*	$3.75	$3.25	$4.95

SCRAP—The prices following are, f.o.b., per ton, paid by dealers:

	New York Per Gross Ton	Chicago Per Gross Ton	Detroit Per Gross Ton
No. 1 railroad wrought	$10.00@$10.50	*$11.25@$11.75*	.....
Stove plate	6.00@ *6.50*	*9.50@ 10.00*	*$7.00*
No. 1 machinery cast	*7.75@ 8.50*	*12.50@ 13.00*	10.00*
Machine shop turnings	5.00@ *5.50*	*6.00@ 6.50*	*6.00*
Cast borings	*5.00*	8.00@ 8.50	*7.00*
Railroad malleable	10.50@ 11.00	13.50@ *14.00*	*12.00*
Re-rolling rails	*9.50@* 10.00	14.50@ 15.00	**12.25**
Re-laying rails, 56@60 lb.	.....	**23.00@** 25.00	.....
Heavy melting steel, No. 1	9.00 @ *10.00*	12.00@ 12.50	*$11.00*
Iron and steel pipe	7.75	7.00@ 7.50	.....

*Net ton.

FREIGHT RATES—Effective May 20, 1930, on finished steel products in the Pittsburgh district, including plates, structural shapes, merchant-steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished) chains, etc., the following freight rates in cents per 100 lb., apply on carload lots of 36,000 lb. or 18 tons:

Atlanta	$0.58	Detroit	$0.265
Baltimore	.27	Kansas City	.71†
Birmingham	.58	New Orleans	.67
Boston	.40	New York	.33
Buffalo	.235	Pacific Coast (all rail)	1.15*
Chicago	.34	Philadelphia	.29
Cincinnati	.265	St. Louis	.39
Cleveland	.185	St. Paul	.60
Denver	1.15*		

*Minimum weight on structurals, 60,000 lb. †Except iron or steel pipe and fittings.

Railway Materials and Supplies

STEEL RAILS—Manufacturers' quotations per gross ton, f.o.b., for large mill lots:

	Pittsburgh	Birmingham	Chicago
Standard openhearth rails	$43.00	$43.00	$43.00
Light rails, 25 to 45 lb.	36.00	34@36	34@36
Re-rolled rails	34.00	34@36	34@36

RAILWAY TIES—For fair-sized orders, f.o.b., the following prices per tie hold:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
New York	Long-leaf sap pine, untreated	$1.05	$1.20
	Creosoted—prices on application.		
Birmingham	White oak, creosoted	1.52	1.75
	Southern pine, creosoted	1.25	1.60
Chicago	White oak, untreated	1.40	1.78
	Oak, empty cell, creosoted	1.80	2.40
	Oak, zinc treated	1.60	2.10
	Southern pine, creosoted	1.60	2.10
St. Louis	White oak, untreated	*1.00*	*1.60*
	Red oak, creosoted	*1.35*	**2.00**
	Sap pine or cypress, untreated	*.80*	*1.15*
San Francisco	Douglas fir, green, untreated	.70	1.06
	Douglas fir, empty cell, creosoted	1.47	2.38
Montreal	Birch or maple, untreated	.75@1.25	.75@1.25
	Birch or maple, creosoted	1.20@1.30	1.50@1.60

Current Prices of Construction Materials

Railway Supplies—Continued

TRACK SUPPLIES—Manufacturers' and dealers' quotations per 100 lb. f.o.b., Pittsburgh mill, for large mill lots, together with warehouse prices at other places named:

	Pittsburgh	Chicago	Birmingham	St. Louis	San Francisco
Standard spikes, ½-in. and larger	$2.80	$3.55	$3.45	$3.65@$3.75	$4.10
Track bolts	3.80@4.00	4.55	5.85	4.65@ 4.75	5.10
Standard section angle bars, splice bars or fish plates	2.75	3.40	3.75	.....	.....

Tie plates: Price at Pittsburgh mill, $2.07½ per 100 lb.

Pipe

WROUGHT-STEEL PIPE—Discounts from manufacturers' and dealers' standard lists:

	1 to 3-In. Butt Weld		3½ to 6-In. Lap Weld	
	Black	Galvanized	Black	Galvanized
Chicago, warehouse, delivered	57.3%	44.8%	53.9%	41.4%
Cleveland, warehouse, delivered	53.3%	42.3%	50.8%	37.8%
New York, warehouse, delivered	*56.1%*	*43.6%*	*52.7%*	*40.18%*
Pittsburgh, large mill lots, f.o.b.	64%	52.5%	61%	49.5%
St. Louis, warehouse, delivered	51%	48%	48%	35%

CAST-IRON PIPE—Prices of U. S. Pipe & Foundry Co., per net ton, for bell and spigot pipe, Class B and heavier, f.o.b., on regular lots of pipe:

	4-In.	6-In. and Over
Atlanta	.....	$43.00
Birmingham mill	$40.00@$41.00	37.00@$38.00
Burlington (N. J.) mill	40.00	37.00
Chicago	48.20@ 49.20	45.20@ 46.20
Dallas	.....	52.00
New York	42.90	39.90
Pittsburgh	48.80@ 49.80	45.80@ 46.80
St. Louis	48.00	45.00
San Francisco	50.00@ 51.00	47.00@ 48.00

Gas pipe and Class A, $3.00 per ton extra.

SEWER PIPE—Prices delivered, per foot, for standard pipe; 6, 8 and 12-in. are single strength and 18, 24, 30 and 36-in. are double strength:

	6-In.	8-In.	12-In.	18-In.	24-In.	30-In.	36-In.
Atlanta	$0.16	$0.26	$0.45	.....	.....	.....	.....
Baltimore	.10	.30	.58	.....	$1.93	.....	$6.50
Birmingham	.25	.40	.65	$1.50	2.75	$3.90	5.85
Boston	.185	.30	.56	1.35	2.25	3.70	6.50
Chicago	.18	.28	.54	1.25	2.25	4.75	6.00
Cincinnati	.135	.21	.405	1.05	1.89	3.456	5.4325
Cleveland	.189	.294	.567	1.35	2.43	4.824	7.38
Dallas	.25	.375	.68	1.60	2.85	.....	.....
Denver	.161	.23	.414	.816	1.44	.....	.....
Detroit	.18	.28	.6075	1.50	2.70	5.12	7.91
Kansas City	.21	.29	*.51*	.....	1.90	3.80	.....
Los Angeles	.21	**.29**	**.52**	1.186	2.03	3.39	5.09
Minneapolis	.16	.25	.50	1.15	1.85	3.49	4.97
Montreal	.36	.53	.78	1.48	2.75	4.20	.....
New Orleans	.195	.325	.585	1.10	2.11	.....	.....
New York	.17	.265	.52	1.30	2.34	4.47	6.86
Philadelphia	.117	.182	.351	1.05	1.89	3.60	5.6375
Pittsburgh	.0945	.147	.2835	.85	1.53	3.024	4.8175
St. Louis	.1645	.26	.468	1.092	1.872	3.65	4.80
San Francisco	.1925	.275	.495	1.155	1.98	3.30	4.95
Seattle	.22	.30	.54	1.26	2.16	3.50	.....

CLAY DRAIN TILE—Prices delivered by dealers, per 1,000 lin.ft.:

Size, In.	New York	Birm'ham	St. Louis	Dallas	San Fran.	Seattle
4	$55.00	$56.00	$50.00	$63.00	$67.50	$60.00
6	112.00	112.00	85.00	100.00	112.50	112.00

Miscellaneous

LINSEED OIL—Raw oil, f.o.b., in 1- to 4-bbl. lots, per lb.:
New York.... *$.0146* Chicago.... *$0.148* Minneapolis...*$0.153*
Atlanta..... $ 1.31 Dallas..... $ 1.10

WHITE AND RED LEAD—Base price per 100-lb. keg, f.o.b., New York: White, dry, $13.75; White, in oil, $13.75; Red, dry, $13.75; Red, in oil, $15.25.

CHEMICALS—Water, sewage treatment, road work, round lots in the New York market:

Sulphate of aluminum, in bags, per 100 lb	$1.40@$1.45
Sulphate of copper, in bbl., per 100 lb	4.75@ 5.00
Soda ash, 58%, in bags, per 100 lb	1.32@ 1.35
Chlorine, cylinders, per lb	.04½@ .06
Bleaching powder, in drums, f.o.b. works, per 100 lb	2.00@ 2.10
Calcium chloride, flaked, in drums, f.o.b. works, per ton	22.75

MANILA ROPE—The number of feet per pound for the various sizes is as follows: 5-in., 7-ft., 6-in.; 2-in., 6-ft., 1-in.; ¾-in., 4-ft., 5-in.; 1-in., 3-ft., 8-in.; 1¼-in., 2-ft., 5-in.; 1½-in., 1-ft., 8-in. Following prices are quoted by dealers per pound for ¾-in. and larger:

Atlanta	$0.25	Kansas City	*$0.24*
Baltimore	.225	Los Angeles	.25
Birmingham	.26	Minneapolis	*.21*
Boston	.215	Montreal	.185
Chicago	*.19*	New Orleans	.25
Cincinnati	.21	New York	.205
Cleveland	.21	Philadelphia	.23
Dallas	**.25**	San Francisco	*.195*
Denver	*.22*	Seattle	*.195*
Detroit	.23	St. Louis	.205

BUILDING PAPER—Black, 50-lb., in carloads, per roll of 500 sq.ft., f.o.b., producing point $2.20

SLATERS FELT—In carloads, per roll, f.o.b., producing point $0.85

ROOFING MATERIALS—Price f.o.b., New York, delivered by dealers to contractors in carloads:

Asphalt felt, per 100 lb	$3.00
Tar felt, per 100 lb	3.00
Asphalt coating, per gal	.34½
Tar pitch, in 350 lb. barrels, per ton	28.00

PREPARED ROOFINGS—Prices delivered by dealers to contractors, in each load, f.o.b. New York, per square:

Single shingles, slate finish, sufficient to cover 100 sq.ft.	$6.12
Strip shingles, 4 in 1, hexagonal shape, with Underwriters' label	6.00
Slate surfaced roofing in rolls weighing 85 to 90 lbs.	2.50

WINDOW GLASS—United inches 25, bracket size 6x8 to 10x15, single or double thickness, discount from jobbers' list (Sept. 15, 1928), at New York warehouses:
AA..... 83% A..... 86% B..... 88%

EXPLOSIVES—Manufacturers' quotations per pound for dynamite delivered in small lots, under 200 lb.:

	Gelatin 40%	Gelatin 60%		Gelatin 40%	Gelatin 60%
Atlanta	$0.22	$0.245	Los Angeles, f.o.b.†	$0.1875	$0.2225
Baltimore	.215	.2375	Minneapolis	.2225	.2450
Birmingham	.22	.245	Montreal	.20	.24
Boston	**.225**	**.255**	New Orleans	.195	.22
Chicago	.195*	.22*	New York	.255‡	.2775‡
Cincinnati	.22	.245	Philadelphia	.215	.24
Dallas	*.20*	**.30**	St. Louis	.215	.235
Denver, f.o.b.	.19	.2125	San Francisco	.155	.18
Kansas City, Mo.	.2025	.2225	Seattle	.1525	.175

*Quantities above 500 lb. but less than a ton. †San Fernando Arsenal. ‡Special gelatin in case lots.

Lumber

Prices Are Per Thousand Feet, Board Measure

New York—Timbers, No. 1 Common, rough, delivered in Manhattan to contractor at site of job, in 20 ft. lengths and under, per M. ft., b.m.:

	Long-leaf Yellow Pine	Douglas Fir
3x4 to 8x8	$50.00	*$37.00*
3x10 to 10x10	60.00	*38.00*
3x12 to 12x12	70.00	*39.00*
3x14 to 14x14	80.00	*47.50*

Chicago—Prices, f.o.b., in carloads, No. 1 Common, rough per M. ft. b.m. For delivery to job from stock, in truckloads, add $10 per M. ft., b.m.:

	20 Ft. and Under Long-Leaf Yellow Pine	Up to 32 Ft. Douglas Fir
3x4 to 8x8	$43.00	*$39.50*
3x10 to 10x10	50.50	*39.50*
3x12 to 12x12	62.50	*39.50*
3x14 to 14x14	74.50	*40.50*

San Francisco—Douglas fir, No. 1 common, rough, at yards. For delivery to contractor at site of job, add $1.50 to $5 per M. ft., b.m.:

	10-16-18 and 20 Ft.	22 and 24 Ft.
3x3 and 4	*$30.00*	*$32.00*
3x6 and 8	*30.00*	*32.00*
3x10 and 12	*30.00*	*32.00*
3x14	*33.00*	*34.00*

Other Cities—Delivered by dealers, No. 1 Common, rough, per M. ft., b.m.:

	8x8-In. x 20 Ft. and Under				3x12 to 12x12-In. 20 Ft. and Under	
	Pine*	Fir†	Hemlock	Spruce	Pine*	Fir†
Atlanta	$55.00	.....	.....	.....	$65.00	.....
Baltimore	36.00	$50.00	$53.50	$61.00	75.00	$50.25
Birmingham	53.00	.....	.....	.....	56.50	.....
Boston	52.50	45.00	47.00	48.00	60.00	40.00
Cincinnati	47.50	58.50	.....	.....	65.00	52.50
Cleveland	*58.00*	*58.00*	.....	.....	*58.00*	*58.00*
Dallas	55.00	55.00	*52.50*	55.00	55.00	*52.50*
Denver	.....	50.00	47.50	47.50	.....	55.00
Detroit	54.00	52.00	.....	.....	68.50	52.00
Kansas City, Mo.	37.50	**45.50**	.....	.....	52.50	55.00
Los Angeles	.....	42.50	.....	.....	.....	44.50
Minneapolis	56.00	48.25	37.25	.....	$56@58	49.75
Montreal	50.00	48.00	.....	.....	56.00	48.00
New Orleans	52.00	48.00	.....	44.00	67.00	65.00
Philadelphia	50.00	43.00	42.00	48.00	60.00	43.00
Pittsburgh	65.00	70.00	75.00	65.00	65.00	65@72
St. Louis	**51.00**	**46.00**	**44.00**	.....	**62.00**	**46.00**
Seattle	.....	18.00	.....	.....	.....	19@20

	1x10 In. x 16 Ft. and Under			2x10 In. x 16 Ft. T. & Gr.	
	Pine*	Fir†	Hemlock	Pine*	Fir†
Atlanta	$60.00	.....	.....	$42.50	.....
Baltimore	55.00	$44.50	$44.00	.....	.....
Birmingham	36.00	.....	.....	45.00	.....
Boston	46.50	40.00	42.00	48.50	$45.00
Cincinnati	61.00	52.50	.....	38.00	50.00
Cleveland	60.00	*48.00*	.....	*45.00*	58.00
Dallas	60.00	.....	.....	55 00	.....
Denver	.....	38.00	38.50	.....	44.00
Detroit	48.50	45.00	.....	48.50	47.00
Kansas City, Mo.	*50.00*	36.75	.....	**37.50**	**35.75**
Los Angeles	.....	41.50	.....	.....	55.00
Minneapolis	51. 0	42.00	38.75	49.00	41.00
Montreal	56.00	.....	.....	.....	.....
New Orleans	49.00	49.00	.....	59.00	55.00
Philadelphia	52.00	43.00	41.00	55.00	44.00
Pittsburgh	50.00	60.00	59.00	42.00	
St. Louis	**47.00**	**45.00**	**45.00**	**47.50**	**45.00**
Seattle	.....	18.00	.....	.....	19.00

*Long-leaf yellow pine. †Douglas fir.

PILES—Prices of Nichols Bros., 90 West St., N.Y.C., per lineal foot, pine, with bark on, f.o.b., New York; delivered from barge, 1¢ to 2c. per ft. additional:

Dimensions	Points	Length	Barge	Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.14½	$0.18
12 in.—2 ft. from butt	6 in.	50 to 59 ft.	.19	.23
12 in.—2 ft. from butt	6 in.	60 to 69 ft.	.21½	.25
14 in.—2 ft. from butt	6 in.	50 to 69 ft.	.25½	.36
14 in.—2 ft. from butt	6 in.	70 to 79 ft.	.27½	.51
14 in.—2 ft. from butt	5 in.	80 to 85 ft.	.33	.41
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	.38	.45

Unit Prices From Current Construction Bids

Water-Works Improvements for Clinton, Okla.

AN IMPOUNDING reservoir, dam, filtration plant and pipe lines and main extensions for Clinton, Okla., were let in April, 1930, to the Standard Paving Co., 2119 East Eleventh St., Tulsa, for $526,758. This bidder was lowest on each of the three sections:

I—Earthfill dam, complete with concrete cutoff, corewall, riprap, clay puddle, Ambursen-type concrete spillway section; inclosed filtration plant, complete with intake, machinery, apparatus, piping and valves, and all grubbing and clearing.

II—Trenching, furnishing and laying pipe materials, and backfilling; furnishing and setting gate valves, blowoffs, air valves, and appurtenances for 18-in., 16-in. granite supply line of de Lavaud cast-iron pipe; connection to the existing 300,000-gal. elevated tank in city; furnishing and installing 12-in. altitude valve, complete with strainer and housing; making connection to plant at the reservoir.

III—Furnishing and laying cast-iron city water mains, furnishing and setting valves, hydrants, special castings, cutting and replacing pavement, making wet connections to the existing mains, and furnishing and installing a recording water pressure gage.

Bidding—Unit prices are given of the lowest three bidders on each of the sections. On each section "A" is the Standard Paving Co. The others are: Sec. I, "B" is Sherman Machine & Iron Works, Oklahoma City; "C," H. L. Cannady Co., Tulsa; Sec. II, "B" is Sherman Machine & Iron Works; "C," Ashland Construction Co., Enid, Okla.; Sec. III, "B" is Sherman; "C," H. L. Cannady. Benham Engineering Co., Oklahoma City, is consulting engineer.

SECTION I

	A	B	C
Clearing reservoir site (lump sum)	$1,500.00	$1,500.00	$1,700.00
129,000 cu.yd. earth embankment above prepared subgrade of dam, including clearing and grubbing, preparation of subgrade, clay puddle above ground surface and Bermuda grass	0.42	0.30	0.44
10,000 cu.yd. clay puddle below subgrade	1.25	.40	1.20
1,120 cu.yd. reinforced 1,500-lb. (approx. 1:3:5) concrete corewall	22.00	15.00	22.50
395 cu.yd. reinforced 2,000-lb. (approx. 1:2:4) concrete corewall	26.00	19.75	25.00
13,000 sq.yd. hand-placed stone riprap, 10 in. thick	1.90	1.30	2.00
3,800 sq.yd. 1:3 cement-mortar-pointed stone riprap, 10 in. thick	2.10	1.70	2.20
500 cu.yd. loose rock excav. for earth section of dam	1.25	1.50	1.25
750 cu.yd. solid rock excav. for earth section of dam	2.00	2.50	1.90
Ambursen-type rein.-conc. spillway section with inclosed filtration plant, complete with conc. work, excav., filter plant equipment (lump sum)	128,000.00	180,000.00	137,000.00
For Ambursen-type rein.-conc. spillway section and plant:			
Extra earth excav., per cu.yd.	.50	.40	.45
Extra loose rock excav., per cu.yd.	1.00	1.50	1.10
Extra solid rock excav., per cu.yd.	2.50	2.50	2.50
Extra 2,000 lb. (not leaner than 1:2:4) conc., per cu.yd.	20.00	25.00	25.00
Extra reinforcing steel in place, per lb.	.04	.06	.05
Totals	$266,095	$274,786	$278,945

SECTION II

	A	B	C
DeLavaud cast-iron pipe, leadite joints:			
22,000 lin.ft. 18-in. class 50	$2.498	$2.62	$2.76
28,000 lin.ft. 18-in. class 75	2.498	2.62	2.76
19,500 lin.ft. 16-in. class 75	2.277	2.40	2.57
12,200 lin.ft. 16-in. class 100	2.277	2.40	2.57
200 lin.ft. 12-in. class B B&S c.-i. pipe, leadite joints	2.50	2.50	2.86
Hub end gate-valves and boxes:			
8—18-in.	200.00	250.00	250.00
5—16-in.	145.00	200.00	175.00
1—12-in.	80.00	100.00	100.00
1—10-in.	75.00	80.00	80.00
1—10-in. hub end check-valve and box	75.00	80.00	87.50
9—4-in. blowoffs in 18-in. pipe line	90.00	60.00	26.00
5—4-in. blowoffs in 16-in. pipe line	90.00	60.00	26.00
35—1-in. air valves and boxes	24.00	25.00	13.50
43,000 lb. special castings for 10-, 12-, 16-, and 18-in. pipe	.06	.08	.08
500 cu.yd. loose rock excav. in trenches	1.00	2.50	2.25
700 cu.yd. solid rock excav. in trenches	2.00	4.00	3.40
450 lin.ft. railroad crossings	.35	1.00	1.10
200 cu.yd. 1,500-lb. plain conc. (approx. 1:3:5) including earth excav.	14.00	15.00	20.00
2,000-lb. plain conc. (approx. 1:2:4) including earth excav., per cu.yd.	17.00	20.00	24.50
Reinforcing steel in place, per lb.	.05	.06	.06
Totals	$211,773	$224,695	$236,185

SECTION III

	A	B	C
DeLavaud, class 150 B&S c.-i. pipe, leadite joints:			
780 lin.ft. 8-in.	$1.25	$1.35	$1.27
5,460 lin.ft. 6-in.	0.90	0.92	0.96
29,300 lin.ft. 4-in.	.70	.65	.75
23,600 lin.ft. 2-in. 200-ft. head B&S c.-i. pipe, leadite joints	.38	.40	.40
360 lin.ft. taking up and relaying 4-in. B&S. c.-i. pipe	.40	.40	.40
1,500 lin.ft. taking up and relaying 2-in. galv. iron pipe	.25	.30	.30
Hub end gate-valves and boxes:			
2—8-in.	55.00	45.00	75.00
7—6-in.	40.00	30.00	50.00
48—4-in.	23.00	25.00	25.00
77—2-in.	15.00	17.50	15.00
50 standard fire hydrants	60.00	60.00	62.50
31,000 lb. special castings for city mains	.06	.08	.065
400 sq.yd. cutting and replacing pave.	4.00	5.00	3.75
70 wet connections	10.00	20.00	20.00
900 lin.ft. railroad crossings	.35	1.00	25.00
100 cu.yd. loose rock excav. in trenches	1.00	2.00	1.00
100 cu.yd. solid rock excav. in trenches	2.00	4.00	2.25
Totals	$46,890	$49,103	$50,286

Permeable Pile Dikes on the Mississippi

U S. ENGINEER Office at Memphis awarded five contracts in May, 1930, for furnishing and building 29,700 lin.ft. permeable dikes along Mississippi River, to cost $1,268,819. The length may be increased 50 per cent or decreased 40 per cent. Length, location, time of completion and average range between mean low water and bankfull stage of each section are as follows:

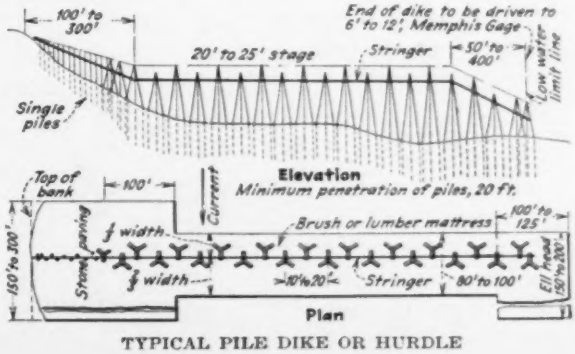
	Lin.Ft.	Miles Below Cairo, Ill.	Days to Complete	Feet Low to Full
(a) Dorena Landing, Mo.	5,000	37–40	110	36
(b) Island 8, Ky.	5,000	42–45	125	36
(c) Toneys Towhead, Ky.	6,000	76–79	140	35.5
(d) Carruthersville, Tenn.	5,500	110–113	140	35
(e) Ashport-Golddust, Ark. and Tenn.	8,200	154–160	220	32

Note: Top of dike is 25-ft. mark of Memphis gage (0–184.21, mean Gulf datum)

The mattress may be either brush or lumber, but uniform in each dike. If brush, the shore mattress is woven 12 in. thick, 100 ft. wide, in lengths of 150 to 300 ft. If lumber, it is three thicknesses of boards, breaking joints not less than 3 ft. and securely nailed together.

Before paving, the bank above the inner edge of the mattress is graded on a regular slope of 1 on 2½ to the top of the bank from 50 ft. above to 100 ft. below to center line of dike. Paving is a single layer of riprap stone 12 to 14 in. thick laid by hand. A cubic yard of stone covers about 25 sq.ft. of bank slope.

The dike (see drawing) consists of one or more rows of piles or clumps of piles driven through the mattress penetrating at least 20 ft. (up to 30 ft.), using a water jet if necessary. Piles 39 ft. or less are driven tips down; 40 ft. or more butts down. The clumps in each row are spaced 10 to 20 ft. c. to c. depending on depth of water, the rows 5 ft. apart. Piles are driven between the rows for stringers.



TYPICAL PILE DIKE OR HURDLE

	Quantity in 5 Secs.	Avg.	Avg. of 16 Bids	(A) Dorena Landing	(B) Island 8	(C) Toneys Towhead	(D) Carruthers-ville	(E) Ashport-Golddust
				—Prices of Lowest Bidder (Contract Prices) on Each Section—				
Lumber in mattress, M. ft.	3,489	695	$92.00	$91.00	$93.00	$89.00	$91.00	$90.00
Stone in mattress, cu.yd.	20,930	4,180	5.43	5.15	5.50	5.00	5.25	5.25
Stone in paving, cu.yd.	10,130	2,030	6.38	6.25	6.50	5.75	5.75	6.25
Stone in dike, cu.yd.	29,700	5,940	5.51	5.15	5.60	5.25	5.50	5.35
Piling in dike, lin.ft.	1,105,600	221,000	0.58	0.55	0.60	0.55	0.56	0.55

which by lap-splicing are made continuous throughout the length of the dike. The shore end of the dike consists of two rows of staggered single piles 5 ft. apart.

Materials—Lumber is cut from live timber, and is 1x4 in. by 12 ft. with acceptance of $\frac{7}{8}$ to $1\frac{1}{4}$ by $3\frac{1}{4}$ to $4\frac{1}{4}$ in. Brush must be live saplings 25 ft. or more in length of $1\frac{1}{2}$ to 4 in. diameter. Stone is in pieces 10 to 100 lb., with one dimension not more than 12 in.

Bidding—Sixteen contractors bid on the five sections, and the average unit prices are given as well as those of the lowest (accepted) bids on each section. The five contractors are: (A) W. P. McGeorge, Pine Bluff, Ark.; (B) and (E) Woods Bros. Construction Co., Lincoln, Neb.; (C) C. W. Hunter Co., Memphis, Tenn.; (D) Badgett Construction Co., Vicksburg, Miss.

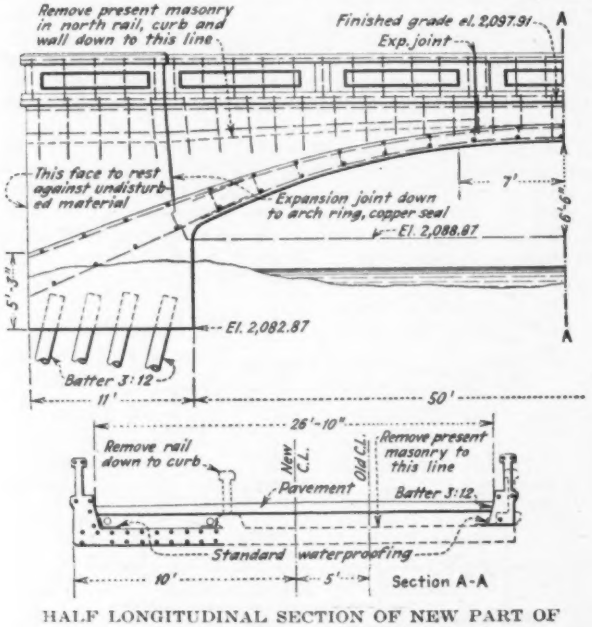
Widening Three Concrete Highway Bridges in Kittitas County, Wash.

THREE two-span concrete arch bridges over Big and Little creeks and the Yakima River on state road No. 2 in Kittitas County, Wash., are being widened 10 ft. on one side by one contractor at a total cost of $27,373, to conform to the recently completed highway system in this area. The first two bridges have 50-ft. spans, the third 100-ft. Total length is 386 ft.

Order of procedure is (1) construct new concrete work on south side of the bridges; (2) backfill over new portion of the arches; (3) remove existing south rails; (4) remove and reconstruct spandrel walls and rails; (5) complete backfilling over arch. Up to the third operation, two-way traffic is maintained, thereafter one-way.

The second item in the tabulation covers backfilling over the arches but not around piers and abutments, the latter being included in structure excavation (Item 1). Old concrete (none may be blasted) may be placed around the footings.

A typical piece of the work is shown in the longitudinal section of half of one of the arches of the Big Creek bridge and a cross-section at the center of this arch.



HALF LONGITUDINAL SECTION OF NEW PART OF ARCH RING AND CROSS-SECTION AT CENTER OF ARCH

Quantities involved in the three bridges were lumped and bids were received from five contractors. Contract was awarded on the low bid, which was 0.5 per cent below the second and 10 per cent below the average. Unit prices of the lowest two are given: (A) D. Nygren, 410 Lyon Bldg., Seattle; (B) Colonial Building Co., 617 Hutton Bldg., Spokane.

KITTITAS COUNTY BRIDGES

	A	B
338 cu.yd. structure excavation	$5.00	$5.50
826 cu.yd. backfill in place	1.00	.75
381 cu.yd. concrete class A	25.00	24.50
179 cu.yd. concrete class B	20.00	24.50
251 cu.yd. concrete class C	20.00	22.00
59,500 lb. steel reinforcing bars	.05	.05
76 lb. copper seal	.75	1.00
66 cu.yd. removing concrete	15.00	8.00
386 sq.yd. waterproofing	.50	.65
790 lin.ft. drain pipe, 4 in. diam. in place	.20	.50
125 driving piles	15.00	17.00
1,936 lin.ft. furnishing piling at site	.25	.30
	$27,373	$28,651

Structural Concrete and Concrete Paving

BUREAU OF PUBLIC ROADS reports on May 24, 1930, the unit prices given below for reinforced-concrete paving and structural reinforced concrete in bids opened in a number of states in April and May.

REINFORCED-CONCRETE PAVEMENT

State	Miles	Thickness in Inches	Sq.Yd.	Price
Maryland	1.94	9–6.3–9	18,150	$1.85
Ohio	3.79	9–7–9	40,586	1.96
Pennsylvania	3.17	9–7–9	22,225	3.10
Pennsylvania	4.05	10–8–10	78,053	2.89
Pennsylvania	4.55	9–7–9	48,098	3.00
Pennsylvania	5.29	9–7–9	55,756	3.00

STRUCTURAL REINFORCED CONCRETE

State	Mix	Cu.Yd.	Price
Arizona	1:2:4	520	$24
Georgia	1:2:4	100	18
Georgia	1:2:4	359	20
Georgia	1:2:4	284	19
Indiana	1:2½:5	139	15
Indiana	1:2½:5	441	18
Kansas	1:2:4	133	20
Maryland	1:2:4	121	17
Massachusetts	1:2:4	179	27
Nebraska	1:2:4	53	30
Nebraska	1:2:3	25	20
Nevada	1:2:4	131	35
Nevada	1:2½:5	87	35
New Hampshire	1:2:4	77	25
Ohio	1:2:4	239	15
Ohio	1:2:3	383	18
Oklahoma	1:2:4	404	15½
Oklahoma	1:2:4	742	13½
Pennsylvania	1:2:4	434	24
Pennsylvania	1:2½:5	662	25
Utah	1:2:4	160	22
Utah	1:2:4	244	21
Virginia	1:2:4	76	20
Virginia	1:2:4	408	21

Classes of Concrete for California Roads

SECTION 29 of the Standard Specifications of the Division of Highways, California, classifies concrete according to the number of bags per cubic yard, as follows:

Class	Bags	Class	Bags
A	6	D	7
B	5	E	9
C	4.2	F	7

In class C concrete, hard, well-wetted boulders may be used. They must not exceed 30 per cent of total volume, nor be more than 14 in. in largest diameter, nor may this diameter exceed one-fourth the width or thickness of the work. They are spaced not closer than 6 in. from each other, or from reinforcing, or from the face of the work.

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	Project	Cost	Status
Sewers			
Chicago	Sewers	$2,566,000	Contract
Streets and Roads			
Massachusetts	Paving	1,005,044	Contract
Railways			
Virginia	Tunnel	1,100,000	Contract
Grade Elimination			
Beaumont (Tex.)	Underpasses, etc.	3,100,000	Proposed
Airport			
Massachusetts	Airport	1,000,000	Proposed
Power & Lighting			
Dallas (Tex.)	Transmission lines	1,258,000	Proposed
Federal Government			
Randolph Field (Tex.)	Officers' quarters, etc.	1,001,947	Contract
Factories and Mills			
Richmond (Calif.)	Assembly plant	3,500,000	Contract
Pittsburgh	Steel plant	20,000,000	Proposed
Power Plants			
Duluth	Steam plant	1,250,000	Proposed
Warehouses			
Cleveland	Warehouse	2,000,000	Proposed
Fort William (Ont.)	Freight sheds	1,000,000	Proposed
Buildings			
Fort Worth (Tex.)	Club	1,000,000	Proposed
Kansas City (Mo.)	Office	2,500,000	Bids asked
Columbus (O.)	Office	2,000,000	Proposed
Dallas (Tex.)	Office	2,000,000	Proposed
Pasadena (Calif.)	Auditorium	1,050,000	Proposed
Hackensack (N. J.)	Hall of Records	1,000,000	Proposed
Perth Amboy, (N. J.)	Theatre	1,000,000	Bids asked
Newark	Mausoleum	1,000,000	Proposed
Chicago	Railroad station, etc.	1,300,000	Bids asked
Chicago	Fair buildings	2,000,000	Proposed
Maspeth (N. Y.)	Terminal	2,000,000	Proposed

WATERWORKS

PROPOSED WORK

Ark., Cabot — J. O. Gunter, Dallas, Tex., granted franchise complete waterworks, distribution system. J. F. See, mayor.

Calif., Brawley—Filtration plant. $65,000. Burns- McDonald-Smith Eng. Corp., Western Pacific Bldg., Los Angeles, engrs.

Calif., El Cajon—Southern California Water Supply Co., 1010 Bank of Italy Bldg., San Francisco, concrete storage dam, 204 ft. high, 806 ft. long on top, 33,000 ft. 18 in. and 59,500 ft. 25 in. welded steel or concrete pipe lines. Loveland Engineers, Inc., 485 California St., San Francisco, engrs.

Ind., Bedford—New pumping station on White River. $16,000. H. McIntyre, Bradford, engr.

Ind., Bluffton—Preliminary plans pumping station, west end. $15,000. Address City Clerk.

Ind., Evansville—Filtration plant. $15,000. Black & Veatch 700 Mutual Bldg., Kansas City, Mo., engrs.

Kan., Holton—Waterworks improvements. To exceed $15,000. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs.

Mass., Pittsfield—Main in McAlester, Elm and Williams Sts. to Dalton line. $90,000. Address City Engineer, City Hall.

Mo., Hornersville—Preliminary plans waterworks, distribution system. Russell & Axon, 6200 Easton St., St. Louis, and McDaniel Bldg., Springfield, engrs. $25,000 bond election soon. Noted July 24.

Mo., Kennett — Additions, improvements to waterworks, distribution system. $31,400. W. A. Fuller, 2916 Shenandoah Ave., St. Louis, engrs.

Mont., Great Falls — Reservoir, filtration plant. To exceed $15,000. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs.

N. J., Perth Amboy — Bd. P. Wks., 16 in. pipe, electric pumping equipment, distribution system for house connections in Bordentown Ave. $43,000. L. P. Booz, Perth Amboy, engr.

N. D., Williston — Water purification plant. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

O., Cleveland—Comrs. Cuyahoga Co., mains Impvt. 563 from Warrensville Heights to Maple Heights Villages. $50,000. W. J. Rogers, Court House, engr.

O., Dayton—Waterworks Dpt., W. W. Morehouse, dir., two 1 m.g. rein.-con storage tanks. $45,000.

O., Portsmouth—Comrs. Scioto Co., 40,000 ft. 6- to 12-in. mains, one hundred twenty-four 6- to 12-in. valves, 68 hydrants for waterworks for Wheelersburg, $148,000; also 250,000 gal. steel tank for Childrens Home, $15,000. C. R. Leune, Portsmouth, co. engr.

Okla., Eaglsboro—Preliminary plans additional drilled wells for water supply. $15,000. A. Janard, mayor. Engineer not selected.

Okla., Mangum—Preliminary plans additional deep well water supply. $30,000. H. T. Lawrence, Mangum, engr.

Tex., Athens—City, c/o J. A. Spencer, well, underground reservoir. $25,000.

Tex., Brownsville—City, 2 story, rein.-con., brick, filtration plant, 4 m.g. sedimentation basin with 12 hr. capacity, 4 or 5 American or rapid type filters for chemical testing. $125,000. Morey & Morey, Praetorian Bldg., Brownsville, engrs.

Tex., Richland Springs—See "Unclassified."

Wash., Montesano — City, A. S. Campbell, supt. water supply, improving, extending waterworks recently purchased from Puget Sound Power & Light Co. $40,000.

Ont., Islington—Etobicoke Twp., 1½ mi. 6 in. c.i. mains, valves, hydrants in Islington and Kingsway Area. $15,000. N. Macnicol, Twp. Offices, engr.

BIDS ASKED

Calif., Chino—Aug. 19, by City Council, furnishing, installing pump for Well 1, sunk to depth 230 ft. in 16 in. hole, delivery of 700 g.p.m.

Calif., Fresno — Aug. 15, by Bd. Supervs. Fresno Co. Waterworks Dist. 1, distribution system, incl. 39,000 ft. 4- to 8-in. pipe. Segel & Brown, Griffith-McKenzie Bldg., engrs. Noted July 17.

Calif., Palmdale—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

Ind., East Chicago—Aug. 22, by Bd. Trustees Dpt. Waterworks, 4735 Olcott Ave., waterworks intake improvements. Pearce, Greeley & Hansen, 6 North Michigan Ave., Chicago, Ill., engrs.; adv. E. N.-R. Aug. 7.

Ind., Rockwell — Aug. 8, by Indiana State Sanatorium, P. Beadle, secy., steel tank on tower, underground mains, pump, motor equipment. $15,000. J. M. Rotz Co., 704 Merchants Bank Bldg., Indianapolis, engrs.

La., Kenner—Aug. 20, by Bd. Comrs. Jefferson Waterworks Dist. 1, mains for new waterworks plant on east side Jefferson Parish; furnishing c.i. mains, special fittings, hydrants, valves, boxes, f.o.b. cars or barges. A. Mentz, Hammond, engr.

Mich., Detroit—Aug. 26, by Bd. Water Comrs., 735 Randolph St., 4,700 ft. more or less 36 in. watermains in Freud Ave.; adv. E. N.-R. Aug. 7.

Mich., Eaton Rapids — Aug. 14, by H. S. DeGolia, city clk., 2,800 ft. 10 in. c.i. mains, special castings, valves, valve boxes, fire hydrants. $15,000. Hoad, Decker, Shoecraft & Drury, Ann Arbor, engrs.

Mich., Rogers City—Aug. 11, by R. B. Henley, secy. and treas., Rogers City Electric Light & Power Co., 120,000 gal. rein.-con. reservoir, pump house, two centrifugal pumps. Hoad, Decker, Shoecraft & Drury, Ann Arbor, engrs.

Minn., St. Louis Park—Aug. 13, by Village, installing 18,389 lin.ft. 6- to 12-in. c.i. mains, 21 hydrants, one 12 in. valve, thirteen 6 in. valves, 10,000 lbs. specials. Alexander & Bradley, 417 New York Life Bldg., Minneapolis, engrs.

N. J., Wanaque—Aug. 19, by North Jersey District Water Supply Comm., 24 Commerce St., Newark, laboratory equipment, incl. fume hoods, laboratory sinks, etc. in water Laboratory at Wanaque Head Works. $5,000. M. R. Sherrerd, Newark, engr.

N. Y., Douglaston—Aug. 12, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, remodeling Pumping Station 8.

N. Y., New York—Aug. 12, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., installing auxiliary chlorine machine equipment, incl. water pump, piping soluation piping, and hose, heating plant, weighing scales, gages, hoist, etc. in Gate House, at Croton Lake Reservoir, Yorktown.

O., Wooster—Bd. Control bids about Sept. 24, 300,000 gal. storage reservoir in Bloomington area. $25,000. A. Wedge, Wooster, engr.

Okla., Crescent—Mayor and City Council in market, one 70 g.p.m. triplex pump, one 350 g.p.m. centrifugal pump, one 30 h.p. and one 10 h.p. motors. J. Favor, supt. Water Dpt.

Pa., McKees Rocks—Aug. 11, by J. W. McLaughlin, secy. Bd Comrs. Stowe Twp., 649 Broadway, 25,000 gal. tank on 75 ft. tower, or 50,000 gal. and 60,000 gal. tank on 75 ft. towers on hill near Schoolhouse in Hanover Plan. L. Hudson, 603 Wabash Bldg., Pittsburgh, engr.

Pa., Phila.—Aug. 13, by Bureau Water, A. Murdock, dir., City Hall, intake conduit, and steel floors and windows at Torresdale—railroad siding at Lardners Point, furnishing and installing 62x93 ft. venturi meters, two 24x12 in. venturi meters, 6, 8 and 12 in. c.i. pipe, pig lead, two 1,800 hp. motors at Belmont and motor driven pumps.

Pa., Pittsburgh—Aug. 12, by E. G. Lang, dir. P. Wks., County Bldg., furnishing, erecting pumping units for Herron Hill Pumping Station. $15,000.

Ont., Sarnia—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., San Francisco—To Dunham, Carrington & Hayden Co., Kansas and Division Sts., furnishing standard galvanized wrought steel pipe with threads and couplings, random lengths, delivered San Mater Co., incl. 13,530 ft. 2 in. at $0.1908, 12,380 ft. 1¼ in. at $0.1418, 525 ft. 4 in. at $0.5932, 1,805 ft. 3 in. at $0.3945 and 7,810 ft. 2½ in. at $0.3017.

Conn., Bridgeport—United Illuminating Co., 1119 Broad St., screen well converting salt water for power uses, incl. tunnels, at steel plant, to C. W. Blakeslee & Sons, 58 Waverly St., New Haven. Est. $75,000.

Ia., Glenwood—P. Chaney, city clk., 500,000 gal. filtration plant, incl. settling basin, pumping equipment, 1,000 ft. 8 in. c.i. pipe, Sect. 1, to J. Hanson, 802 Avenue F, Council Bluffs, $12,595; Sect. 2, to Interstate Machinery & Supply Co., 1006 Douglas St., Omaha, Neb., $10,100; Sect. 3, to Robeck & Humphrey, 4420 Leavenworth Ave., Omaha, Neb., $1,850. Grand total $24,545. Noted Apr. 3.

See proposal advertising on page 140

Constr. News page 51

LEADITE

Trade Mark Registered U.S. Pat. Office

Laying 36-in. Cast-Iron Pipe with LEADITE Joints, in Tulsa, Okla.

LEADITE *Speeds-Up* Water Main Construction

Thoroughness and speed in laying water mains are important items (no question about that).

When LEADITE is used as a jointing material for bell and spigot water mains practically all installation costs are reduced—and, most water works men know that LEADITE makes good joints.

From the elimination of caulking charges, reduction of cost for bell hole excavation, to the saving in handling charges on the job, LEADITE has proven a money saver on thousands of miles of bell and spigot pipe of all sizes from 4 in. in diameter to 84 in. in diameter. In fact, a list of the satisfied Water Works who have successfully used LEADITE—reads like a "Blue Book" of the Industry.

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

No Caulking

Waterworks (Continued)

Ia., Randolph—M. Fitcher, town clk., waterworks, steel stand pipe, to Drake-Williams-Mount Co., Omaha, Neb., $3,250; mains and hydrants, to C. W. Roland Co., 1347 8th St., Des Moines, $9,060; tubular well with strainer, pump, motor, pump house, to Interstate Mchy. Co., 1006 Douglas St., Omaha, Neb., $2,304. Grand total $14,614. Noted Mar. 20.

Md., Baltimore—Bd. Awards, furnishing and delivering valves and hydrants for Bureau of Water Supply, to A. P. Smith Co., 545 North Arlington Ave., East Orange, N. J., $62,015. Noted July 17.

Mass., Barre — Commonwealth of Massachusetts, Boston, intake building and Shaft 8 for Wachusett-Coldbrook Tunnel, Contr. 24, to Munroe & Westcott, Community Theatre Bldg., North Attleboro, $69,669.

Mass., West Boylston—Outlet Building and Shaft 1, for Wachusett-Coldbrook Tunnel, Contr. 25, to Munroe & Westcott, Community Theatre Bldg., North Attleboro, $61,363.

Miss., Hattiesburg—Low level pumping station, filtration plant, mains, connections, to A. H. Guion & Co., Gastonia, N. C., $201,900; switchboard and power and light wiring for pumping waterworks station, to Central Electric Co., Hattiesburg, $19,740.

Miss., Hattiesburg—Bd. Waterworks Comn., 5 m.g. rein.-con. reservoir, to Smith-Pew Constr. Co., Atlanta, Ga., $76,000; filtration plant, to Voltz Constr. Co., Baltimore Bldg., Memphis, Tenn., $22,500. Noted July 3.

Mont., Great Falls—City W. H. Harrison, city clk., 12- to 16-in. mains to Fagenstrom Bros., Great Falls, $38,807—steel tank on tower to Minneapolis-Moline Power Implement Co., 29th St. and Minnehaha Ave., Minneapolis, Minn., $5,327 and two 500 g.p.m. centrifugal pumps to Crane Co., Great Falls, $2,181. Grand total $46,315. Noted Feb. 13.

Neb., Adams — R. B. Winter, village clk., 40,000 or 50,000 gal. tank on 70 ft. tower, to Omaha Steel Wks., 609 South 48th St., Omaha; 19,188 ft. 4- to 8-in. B c.i. McWane, DeLavaud, Mono cast or Universal pipe, 4 tons specials, 1,200 ft. 2 in. c.i. or galvanized pipe, 30 hydrants, 14 valves and boxes, 1 well, 80 g.p.m. pump, 10 hp. motor, to Arthur A. Dobson Co., 824 1st Natl. Bank Bldg., Lincoln, and Humphrey Co., 4420 Leavenworth St., Omaha. Est. $27,100. Noted June 26.

New York—Bd. Water Supply, 346 Bway., New York, sluice gate and operating mechanism for Uptake Chamber 1, Hill View Reservoir, to Hardie-Tynes Mfg. Co., 800 North 28th St., Birmingham, Ala., $10,752. Noted July 10.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenue M, to Ozone Park Contg. Co., 96-29 Rockaway Blvd., $7,636. Noted June 24.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in 43rd Ave., to Gregory Contg. Co., 351 East 124th St., New York, $5,983. Noted July 24.

Okla., Norman—Bd. City Comrs., new Diesel engine and air compressor, to Fairbanks Morse Co., 1218 Liberty St., Kansas City, Mo., $24,460. Est. $30,000. Noted July 17.

Pa., Camp Hill—State, water supply and sewage pipe lines for Cumberland Valley State Institution for Mental Defectives, here, to Gannett, Seelye & Fleming Engrs., Inc., 600 North 2nd St., Harrisburg, $140,000.

B. C., Burnaby—Burnaby Municipality, c.i. pipe, pressure centrifugal cast, to Evans, Coleman & Evans, Ltd., foot of Columbia Ave., Vancouver, $32,000.

Ont., Islington—Etobicoke Twp. laying 7,000 ft. 6 in. c.i. mains, to French River Contg. Co., 2 Henderson St., Toronto; 2,000 ft., to G. B. Moogk, Weston. Est. $18,000. Owner to purchase pipe and fittings. Noted July 31.

Ont., Kingston—Public Utilities Comn., 400 hp. motor, 14 in. 7 m.g.p.d. pump, to Turbine Equipment Co. Ltd., 73 King St. W., Toronto. Est. $7,500. Noted May 29.

Ont., Sarnia—City, laying 3½ mi. c.i. mains from St. Clair River to Exmouth and Front Sts., by day labor. Est. $100,000. Furnishing 800 tons c.i. pipe, to National Iron Corp., foot of Cherry St., Toronto, at $49.50 per ton.

SEWERS

PROPOSED WORK

Ark., Little Rock—Preliminary plans sanitary sewers in Sewer Impvt. Dist. 116. $25,500. F. A. Pritchett, 701 Wallace Bldg., engr.

Calif., San Francisco—For Sect. D-Alemany Storm Drain-Toland Ave. to Oakdale Ave., incl. 1,200 lin.ft. 8 x 14 ft. wooden box sewer, 200 lin.ft. 3 x 4 ft. 6 in. wooden box sewer, 7,000 lin.ft. piling. $50,000. M. M. O'Shaughnessy, city engr.

Calif., San Francisco—For Sect. D Alemany Storm Drain from Bayshore Blvd. to Toland St., incl. 915 lin.ft. 2 compartment 8 ft. x 11 ft. monolithic concrete sewer, 350 lin.ft. 2 ft. 6 in. x 3 ft. 9 in. rein.-con. sewer, 77,000 lin.ft. piling. $160,000. M. M. O'Shaughnessy, city engr.

Calif., Soledad—Sewer mains, sewage treatment plant, plain sedimentation and separate sludge digestion. $30,000. C. C. Kennedy, Call Bldg., San Francisco, engr.

Ill., Dupo—For 2.25 mi. outlet sewer from village to Mississippi River, pumping station, connecting laterals. $98,000 voted. Schwaab & Shepard, Faulstitch Bldg., Alton, engrs. Noted Jan. 30.

Ind., Aurora — Common Council, sewer in Conwell St., $25,000. T. Dartnell, Aurora, engr.

Ind., Lafayette—Bd. P. Wks., sewer in Smith St. $25,400. P. D. Rooney, Lafayette, city clk.

Ind., Richmond—Bd. Wks., 5,563 ft. 30- to 90-in. relief sewer in B St. $165,000. S. Hodgin, Richmond, engr.

Kan., Columbus—Rebuilding sewerage plant. $50,000. F. T. Archer & Co., 600 New England Bldg., Kansas City, Mo., engrs.

Minn., Olivia—Village, J. N. Rocik, clk., 1 mi. sanitary sewerage system, disposal plant. $32,000. Druar & Milinowski, 904 Globe Bldg., St. Paul, engrs.

Mo., Mexico—Sewage disposal plant. To exceed $25,000. Black & Veatch, 700 Mutual Bldg., Kansas City, engrs.

N. J., Allenwood—Bd. Boro Council, Boro Hall, 1 story, steel, concrete sewage disposal plant. $25,000. L. Cubberly, 210 Bway., Long Branch, engr. Noted Apr. 17.

N. J., Clark—Twp. Com., Twp. Hall, preliminary plans sanitary sewers. $140,000. L. L. Condert, Westfield, twp. engr.

N. J., New Brunswick—Bd. City Comrs., City Hall, storm water sewer in Remsen Ave. $40,000. A. Atkinson, city engr. Noted July 24.

S. C., Spartanburg—Spartanburg Metropolitan Sewer Dist., T. H. Daniels, chn., 15 mi. 15- to 36-in. vitr. clay or concrete sewers, 3 m.g. and 1.5 m.g. sludge digestion type disposal plant. Harwood Beebe Co., Spartanburg, consult. engrs.

Ont., Windsor—Vitr. tile storm and sanitary sewers in 8 avenues. $114,002. R. J. Desmarais, City Hall, engr.

BIDS ASKED

Calif., Los Angeles—Aug. 13, by Bd. P. Wks., City Hall, North Outfall Sewer, 13,434 ft. 42- to 54-in. precast concrete pipe in Sect 34 C and 12,846 ft. in Sect. 34D.

Ill., Chicago—Aug. 21, by H. E. Hoff, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., 4,640 lin.ft. 3 ft. 6 in. sewer in villages of Broadview, Westchester and Hillside; adv. E. N.-R. Aug. 8.

La., New Orleans — Oct. 1, by Sewerage & Water Bd., at office A. G. Moffat, secy., 526 Carondolet St., drainage stations, other improvements; adv. E. N.-R. Aug. 7.

Mass., Newton — City, G. E. Stuart, comr., City Hall, taking bids 1,600 ft. 12 in. sewers in Edmund Park.

Mich., Detroit—Aug. 12, by H. L. Dingman, drain comr. Wayne Co. Sects. 1 and 2 Brownstown Creek Drain, $40,000.

Minn., Oliva—Aug. 12, by City, M. Erickson, clk., 67,470 lin.ft. 8- to 15½-in. vitr. tile sewer, manholes, disposal plant, imhoff tank, pumps, and motors. $32,000. Druar & Millinowski, 904 Globe Bldg., St. Paul, engrs. Noted July 31.

Mo., St. Louis — Aug. 26, by Bd. P. Serv., Southwestern Sewer 5, 1,605 ft. 12- to 36-in. vitr. clay and segmental block pipe, $8,840; Harlem Creek Sewer 27, 1,030 ft. 10- to 15-in. vitr. clay pipe, $3,640; Harlem Creek Sewer 28, 1,100 ft. 8- to 18-in., $4,400; Glaise Creek Sewer 30, 1,415 ft. 12- to 27-in. vitr. clay pipe, $9,200; Rock Creek Sewer 18, 1,100 ft. 8- to 27-in. vitr. clay pipe, $6,100. W. W. Horner, city engr.

N. Y., Brooklyn—Aug. 13, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewer in Avenues U and V, Kenmore and Elmore Pls., Bedford and Oceans Aves., East 48th and East 49th Sts.

N. Y., Elmsford — Aug. 18, by Bd. Village Trustees, sanitary sewers. $700,000. Denehy & Clarke, White Plains, engrs. Noted July 31.

N. Y., New York—Aug. 12, by W. J. Flynn, acting pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Southern Blvd., Crotona Pkwy., Boston and West Farms and Williamsbridge Rds., Tremont, Belmont, Hughes, Paulding, Allerton Aves., East 178th, East 189th Sts.

O., Elyria—Aug. 15 by J. N. Eidt, safety Serv. Dis., constructing ejector station, Pine St. Est. $20,000. G. B. Gascoigne, Leader Bldg., Cleveland, engr.; 5,800 ft. 6 to 30 in. vitr. sewers, 2,500 ft. 6 in. house connections, 18th St. Storm Sewer Dist. $27,000. J. M. Powell, city engr. Noted July 31.

Okla., Lawton—Aug. 10, by City, 24 and 36 in. rein.-con. storm sewers. $50,000. F. E. Lawrence, Lawton, engr. Noted July 24.

Okla., Lawton—Aug. 12, by F. Sanders, city clk., Squaw Creek Storm Sewer, incl. 7,700 ft. 15- to 36-in. concrete or vitr. clay pipe. $50,000. F. E. Lawrence, Lawton, engr. Noted Jan. 23.

Pa., Brentwood — Aug. 14, by F. H. Appentodt, secy., Municipal Bldg., 3624 Brownsville Rd., sanitary sewers 2.5 mi. various streets. R. A. Schneider, 2706 Brownsville Rd., Pittsburgh, engr.

Pa., Glassport—See "Streets and Roads."

Pa., McKees Rocks—Aug. 20, by J. W. McLaughlin, secy., Municipal Bldg., Island Ave., 1,252 lin.ft. 26, 42 and 48 in. straight and curved concrete pipe sewer and 814 lin.ft. 20 in. straight and curved concrete or terra cotta pipe sewer manholes, etc. in Nichol Hollow, Hanover Heights, McCoy Ave. and Elizabeth St. McGinness & Reed, Singer & Dohrman Sts. engrs.

Ont., Toronto—Aug. 12, by B. S. Wemp, mayor, vitr. tile storm sewers in Adelaide St. and 5 lanes; concrete sewers in Keating St. Sect. A, Church St. Sect. B in Central Harbor Development. $75,000. R. C. Harris, City Hall, engr.

CONTRACTS AWARDED

Conn., Bridgeport—Storm and sanitary sewers in various streets, to Clark Sewer Constr. Co., 631 Lindley St. Est. $50,000.

Ill., Chicago—Bd. Local Impvts., City Hall, tile sewers, brick manholes, catch basins in West Monroe, North and South Peoria, Loomis, West Madison, Sheldon, North and South Leavitt Sts., to Underground Constr. Co., 130 North Wells St.; South Newcastle and South Oak Park Aves., to A. Scully, 4504 Wrightwood Ave.; Paulina St., to O. Scully Co., 7658 Laflin St.; South Mulligan, South Narragansett, South Nagle, South Natchez, South Neenah, South Nashville, South Natoma and Archer Aves., to C. Fosco, 908 South Irving Ave.; South Damen Ave., to F. Peyrot, 4309 North Mason St. Est. $2,566,000. Noted July 17.

Ill., Chicago—H. E. Hoff, clk., Sanitary Sewer Dist., 9½x12 ft. horseshoe vitr. terra Monroe Street Sewer to Underground Constr. Co., 130 North Wells St., $2,046,975. Noted July 10.

Ill., Rockford—Bd. Trustees Sanitary Dist. of Chicago, sewage treatment plant, appurtenances, general work, to J. T. Walbridge, 1014 South Michigan Ave.; pumps, to Worthington Pump & Mchy. Co., 400 West Madison St.; electrical equipment, not yet awarded. Est. $400,000. Noted June 26.

Ind., Chesterton—Eighth St. Trunk Sewer, to General Dredging Co., Ft. Wayne, $104,600.

Ia., Boone—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

Ia., Waterloo — Reconstructing, repairing sewers in East 4th St., to Sieg Constr. Co., 902 Campbell St., $36,021.

Kan., Brewster — Sanitary sewer system to O'Neil Constr. Co., Leavenworth, $23,120.

Kan., Wichita—Lateral J. Dist. 6, Sanitary Sewer 12, incl. 5,825 ft. 15 in. d.s. vitr. and 13,665 ft. 8 in. vitr. sewers, 105 manholes, to Dobson & Humphreys, Lincoln, Neb., $24,170.

Md., Baltimore—Bd. Awards, 4,054 ft. 8 ft. 6 in. x 8 ft. 6 in. semi elliptic brick and concrete drains, 1,211 ft. 27, 30, 36 and 48 in. rein.-con. pipe drains, 1,134 ft. 15 and 18 in. vitr. pipe sewers and drains, Storm Water Contr. 152, to J. Dante, 231 South East Ave., $100,605.

Mass., Newton—City, G. E. Stuart, comr., City Hall, 16,000 ft. 12 in. sewer in Edmund Park, to J. Chesarone, 915 Chestnut St. Noted July 31.

Miss., Greenville — Sewage pumping station, sanitary sewer, mains and laterals, to J. B. McCreary Co., Citizens & Southern Bank Bldg., Atlanta, Ga., $53,980. Noted July 10.

Mo., University City (br. St. Louis)—Sanitary sewers in District 68 to Riley Contg. Co., 110 North 7th St., St. Louis, $23,176.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewer in Mansfield Pl. and Farragut Rd. to P. Tomasetti Contg. Co., 1074 60th St., $35,843 and $22,166 respectively—Clarendon Rd. to G. Ferranti, 1581 Hendericksen St., $4,118. Grand total $62,127. Noted July 3.

Pa., Camp Hill—See "Waterworks."

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., City Hall Annex, branch sewers in Fanshawe St. and County Prison Intercepting Sewer along Pennypack Creek, to R. Di Vito, 6314 Dicks Ave., $3,656 and $24,635 respectively—branch sewers in Foust St., to I. M. Durkin, Ashton and Grant Sts., $15,223; Janette St., to A. Frenzi, 513 High St., $7,485; Magdalena St., to Campellone & Divito, 3856 North 10th St., $5,858; Malvern Ave., to D. Savine, 6413 Vine St., $7,996; Melvale St., to A. McMichael, 506 West Lindley St., $2,142; Montour and 13th Sts., to A. Di Sandro, 609 Rising Sun Ave., $2,258 and $13,217 respectively; Pechin St., to Pizagno & Hirsh, 207 South 15th St., $16,785; Philip St., to P. Pincitti, 4103 Roosevelt Blvd., $5,748; 65th St., to A. J. Henderson, 825 East Washington Lane, $9,317; Williams Ave. and Vernon Rd., to V. Ventresco, 6113 Rose St., $15,566; main sewer in Hammond Ave., to P. and A. J. Ellis, 40 West Wyoming St., $33,165. Grand total $163,051. Noted July 10.

Tex., Amarillo—For 500 lin.ft. 15 in. vitr. sewer, to Clowe & Cowan, Amarillo.

Tex., Dallas—City, c/o E. Goforth, altering Cadiz Outlet Sewer, to T. H. Johnson, North Texas Bldg., $25,393 cost plus basis.

Ont., Toronto—City Council, sewers in Leslie St., Commissioners St. Sect. A., B. and C., to Nelson River Constr. Co., 124 Pears Ave., $215,000; Commissioners St. west of Carlaw Ave., to W. E. Taylor, 22 Lalcon St., $12,781.

BRIDGES

PROPOSED WORK

Ark., Little Rock—Missouri Pacific R.R. Co., Missouri-Pacific Bldg., St. Louis, Mo., E. A. Hadley, ch. engr., and Arkansas Power & Light Co., Picron St., preliminary plans rein.-con. viaduct, 6th and Bond Sts. $90,000-$100,000.

Ind., Anderson—Bd. Comrs. Madison Co. 12 bridges. $33,750. W. Shetterly, aud.

Ind., Decatur — Bd. Comrs. Adams Co. Scheumann Bridge over St. Marys River, Preble Twp. $30,000. R. E. Roop, Decatur, engr.

Ind., Lafayette—Bd. Comrs. Tippecanoe Co. Wea Creek Bridge, on Shadeland Rd. $26,000. R. Meyer, Lafayette, engr.

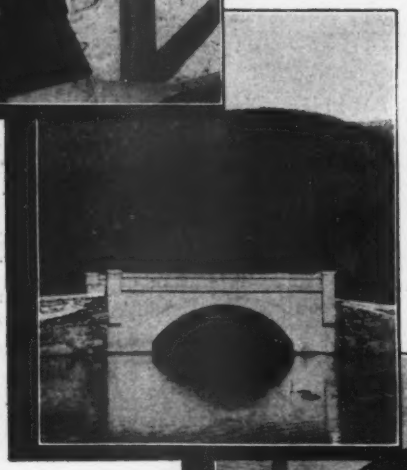
Ind., Richmond—Wayne Co., 726 ft. rein.-con., brick bridge, 47 ft. wide, incl. 12,526 cu.yd. concrete, 546 tons steel, 15,552 lin.ft. wooden piling. G. F. Gaulb, Richmond, engr.

Constr. News page 53

For Jobs Like These . . .

Use High-Early-Strength Concrete made with Universal Atlas Methods and Cement

1 *This High-Early-Strength concrete conveyor pit at yard of Indiana Harbor Lumber and Coal Co. was ready for use in 3 days.*



2 *High-Early-Strength concrete bridge, near Tupper Lake, N. Y., safely carried 5-ton trucks 3 days after concrete was placed.*

3 *39-ton synchronous condenser in operation on High-Early-Strength concrete foundation at plant of Syracuse Lighting Co., Syracuse, N. Y. Average compressive strength at 3 days—3093 lbs. per sq. in.*

4 *High-Early-Strength concrete in driveway pavements at Weyerhaeuser Timber Co., St. Paul, Minn. Ready for use by steel-tired trucks in 3 days.*

WHEN you can speed up a concrete job, you are rendering a service to your company, your client or the public.

High-Early-Strength concrete, made with Universal Atlas methods and cement, has been used for several years by well-known engineers and contractors to save time and secure denser, more durable and more water-tight concrete. Bridges, pavements, sidewalks, floors, building foundations are ready for use in days instead of weeks when High-Early-Strength concrete is used.

The booklet offered below shows in detail how to obtain High-Early Strength concrete with the same standard portland cement as furnished by the Universal Atlas Cement Co. for regular work. Send for a copy and offer your company or clients this time-saving service.

26

Universal Atlas Cement Co.
208 So. La Salle Street, Chicago

Without obligation, please send me booklet giving full details for securing High-Early-Strength concrete with Universal Atlas methods and cement.

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Universal Atlas Cement Co.

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Concrete for Permanence

OFFICES IN: Chicago, New York, Philadelphia, Boston, Newark, Albany, Pittsburgh, Cleveland, Columbus, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Omaha, Oklahoma City, Birmingham and Waco.

Bridges (Continued)

N. J., Alpha—Boro. C. Veit, mayor, bridge over tracks of Lehigh Valley R.R. $50,700. Railroad and Warren Co. will appropriate toward cost.

N. J., Freehold—Bd. Freeholders Monmouth Co., Court House, preliminary plans timber, concrete bridge across Compton Creek. $25,000. G. K. Allen, 60 Broad St., Red Bank, co. engr.

Okla., Witcher — Oklahoma Co. preliminary plans 1 span 140 ft. steel truss bridge on concrete piers. $30,000. J. F. Frazier, Court House, engr.

Tenn., Nashville—Louisville & Nashville R.R., W. H. Courtenay, ch. engr., Louisville, Ky., plans bridge, over Cumberland River, 2nd Ave. near Locust St. $221,000.

Pa., Allentown—Bd. Comrs. Lehigh Co., rejected bids July 17, 3 span bridge over Lehigh Valley R.R. $600,000. Will re-advertise. Noted July 10.

Pa., Indiana—Pennsylvania R.R. Co., Broad St. Sta., Phila., T. J. Skillman, ch. engr., replacing old iron structure with rein.-con. bridge over Black Lick Creek, $85,000.

Ont., Toronto—Two rein.-con. bridges spanning ravine into Lawrence Park subdivision. $100,000. R. C. Harris, comr. Wks.

Ont., Becher—Lambton Co. (Sarnia), 125 ft. concrete, steel bridge over Sydenham River. $30,000. G. A. McCubbin, Chatham, engr. Noted June 19.

Ont., Belleville—City, 2 span 110 ft. concrete bridge on upper crossing of Hy. 2 over Moira River. $30,000. C. A. Mott, city engr.

BIDS ASKED

Ill., Chicago—Aug. 25, by Comrs. Lincoln Park, Clark and Center Sts., constructing superstructure for North Approach of Outer Drive Impvt., between East Grand Ave. and North Pier Terminal Bldg. L. M. Thomas, secy. adv. E. N.-R. Aug. 8.

Ill., Chicago—See "Buildings-Unclassified."

Kentucky—Aug. 28, by State Hy. Dpt., Frankfort, five 45 ft. rein.-con. girder spans with rein.-con. piers, abutments, fill approaches near Graefenburg on Frankfort-Shelbyville Rd., Federal Aid Project 172-AB, Franklin and Shelby Counties. B. Johnson, chn.

Maryland—Aug. 12 by State Roads Comn., Baltimore, concrete slab, double span bridge on Contr. P-135-37 Prince George's Co.—concrete box culvert on Contr. F-132-511, Frederick Co. —extending triple span arch bridge Contr. W-70-67, Washington Co.—double leaf bascule span bridge on Contr. D-65-17, Dorchester Co. H. Williar, Jr., Federal Reserve Bank Bldg., Baltimore, engr.

Mass., Hudson—Aug. 12, by Dpt. P. Wks., State House, Boston, 1,100 ft. rein.-con. bridge, and bituminous macadam approaches. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Scituate—Aug. 19, by Bridge Com., J. W. Turner, chn., c/o Fay, Spofford & Thorndike, engrs., 44 School St., Boston, rein.-con. bridge with stone masonry piers on Edward Foster Rd. $25,00 or more. Noted June 26.

Michigan—Aug. 13 by E. R. Benkert, resident engr., Port Huron, rein.-con., steel deck girder bridge, M-Br. 1 of 74-8-2, Contrs. 1 and 2, Sanilac Co., for State Hy. Dpt., Lansing.

Miss., Batesville—See "Streets and Roads."

N. H., Groton—Aug. 14, by State Hy. Dpt., Concord, two 31 ft. rein.-con. deck girder span bridge.

N. H., Plymouth — Aug. 15, by State Hy. Dpt., Concord, rein.-con. sub-structure for 108 ft. steel truss bridge.

New Jersey—Aug. 11, by State Hy. Comn., Trenton, constructing fenders, removing existing fenders for bridge, Route 10, Sect. B, Contr. 39, Hackensack River, Newark Turnpike, Hudson Co. A. L. Grover, ch. clk.

New Jersey—Aug. 18, by State Hy. Comn., Trenton, reconstructing bridge across tracks Raritan River R.R., incl. approaches, on Route 4, South Amboy. A. L. Grover, ch. clk.

N. Y., Croton—Aug. 12, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, reconstructing Hunters Brook Bridge over Croton Lake.

Pa., Edgewood—Aug. 11, by Boro of Edgewood, W. V. Foust, pres., Boro Bldg., concrete culvert, incl. 400 cu.yd. excav., 1,108 cu.yd. concrete with wire mesh reinforcing, 412 sq.yd. vitr. brick invert, 450 lin.ft. 6 in. concrete pipe laid, also furnishing, delivering 400 cu.yd. gravel, 800 cu.yd. cinders. D. C. Neal, Boro Bldg., Swissvale Ave., engr.

Pa., Pittsburgh—Bd. P. Wks., City County Bldg., taking bids structural repairs to facia and fence, repairs to trusses on Herbs Island Bridge over back channel Allegheny River, repairs and improvements to water lines on Manchester Bridge. $30,000. C. M. Reppert, City County Bldg., engr.

Tennessee—See "Streets and Roads."

CONTRACTS AWARDED

Ark., Arkadelphia—Missouri Pacific R.R. Co., 13th and Olive Sts., St. Louis, Mo., E. A. Hadley, ch. engr., rein.-con., bridge incl. abutment, 5 concrete piers, two 135 ft. and two 550 ft. spans over Ouachita River, to List & Weatherly Constr. Co., Railway Exch. Bldg., Kansas City, Mo. Est. $150,000. Noted Feb. 20.

Calif., Douglas City—State Hy. Comn., Sacramento, bridge over Trinity River, near here, Trinity Co., to Whipple Eng. Co., Monrovia, $83,000. Noted June 26.

Calif., Los Angeles — City, 5 span 310 ft. rein.-con., concrete bridge 56 ft. wide with two five foot sidewalks, incl. 415,117 lb. reinforcing steel, 8 in. asphalt paving 800 ft., to General Eng. Corp. Ltd., 740 South Bway., $204,320.

Idaho—State Hy. Comn., Boise, 1 steel and 4 timber bridges on Riverton Hudson Rd., Fremont Co., to F. J. Anderson, Casper, $39,215.

Ill., Chicago — Bd. Comrs. Lincoln Park, Clark and Center Sts. substructure for North Approach of Outer Dr., Improvement between East Grand Ave. and Michigan Canal, driving piles to bed rock to support the approach, to Werner Constr. Co., 173 West Madison St., $98,385; retaining wall, fill for approach between East Grand Ave. and East Ohio St., to M. E. White & Co., 1735 Fullerton Ave., $56,372. Noted June 19.

Iowa—State Hy. Comn., Ames, to Wickham Bridge & Pipe Co., 1905 West Bway., Council Bluffs, bridges, culverts in Crawford Co., $24,157—to E. W. Ove, Dike, Grundy Co., $1,437—to Forgie & Hroth, Sioux Center, Guthrie Co., $20,980—to Snyder & Johnson, Humboldt, K-491, $17,019 X-722, $29,588; B-635, $1,152, all Muscatine Co.—to A. Olson Constr. Co., Waterlo, Winneshiek Co. $18,589. Grand total $112,922. Noted July 3.

Kansas — State Hy. Dpt., Topeka, bridge in Erie Co., to S. S. Vance & Son, Parsons, $81,740—Eureka Co., to Kipler Bros., Kansas City, $34,429—Winfield Co., to Graig & Marbut, McPherson, $30,047. Grand total $146,216. Noted July 10 under "Streets and Roads."

Me., Bucksport — Directors Waldo-Hancock Bridge, F. A. Peabody, chn. c/o L. D. Burrows, ch. engr., State Hy. Comn., Augusta, superstructure for Waldo-Hancock Bridge, over Penobscot River, near here, to Merritt, Chapman & Scott, 17 Battery Pl., New York, $282,711. Noted July 3.

Maryland—State Rds. Comn., Baltimore, steel superstructure for bridge over Deer Creek between Harmony Church and Darlington, to American Bridge Co., Continental Bldg., Baltimore, $15,706.

Maryland — State Roads Comn., Baltimore, timber bridge (except draw span) over Kent Island Narrows, on Love Point-Queenstown Rd., Contr. Q-43-28, Queen Anne's Co., to Mullan Contg. Co., 3945 Greenmount Ave., Baltimore, $51,008. Noted July 17.

Mass., Northampton—Smith College, concrete bridge, to E. J. Pinney, Inc., 220 Dwight St., Springfield.

Mass., Springfield—Commonwealth of Massachusetts, Dpt. P. Wks., Boston, Springfield-Ludlow Bridge, to Boston Bridge Wks., Inc., 6th and Binney Sts., Cambridge, $112,444. Noted July 3.

Mich., Grandville — State Hy. Comn., 213 Watson Bldg., Grand Rapids, general contract super-structure 550 ft. bridge over Grand River, near here, to J. J. Wernette Enr. Co., 441 Houseman Bldg. Grand Rapids, $99,809; steel for same, to Massillion Bridge & Constr. Co., $33,227.

Minnesota and Wisconsin — Minnesota State Hy. Comn., and Wisconsin State Hy. Comn., at St. Paul, Minn., Stillwater Bridge between Stillwater, Minn., and Houlton, Wis., to Peppard & Fulton, 1004 Roanoke Bldg., Minneapolis, Minn., $247,201. Noted July 3.

Minnesota—State Hy. Comn., St. Paul, Bridge 4957, 140 ft. long, over Pigeon River, Cook Co., and Bridge 4944, 150 ft. overhead structure at Lake City, to Peppard & Fulton, 1004 Roanoke Bldg., Minneapolis, $18,020 and $17,191 respectively. Ontario Govt. pays portion cost first bridge. Noted July 10.

Miss., Belzoni — Bd. Comrs., Main Separate Road Dist. 4 of Humphries Co., 100 ft. creosoted timber bridge 24 ft. wide, one 86 ft. double and one 69 ft. single concrete culvert, forty-eight 12- to 48-in. pipe endwalls, to A. E. Ungeretch, Belzoni, $15,143. Noted June 26.

Miss., Woodville — Wilkinson Co., c/o Bd. Supervs., 8 concrete, steel, timber bridge in Second Supervision Dist., to W. R. Fairchild, Seminary, $27,400.

Mo., Boonville—Missouri-Kansas-Texas R.R. Co., F. Ringer, ch. engr., Railway Exch. Bldg., St. Louis, concrete work and sub-structure for bridge over Missouri River and Missouri Pacific R.R., to Kansas City Bridge Co., Orear Leslie Bldg., Kansas City, $225,000. Total $2,000,000. Noted July 10.

N. J., Jersey City—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, steel, concrete bridge over tracks at Tonnelle Ave., to Parker & Graham, Inc., 5 Colt Ave., Paterson, $305,455.

N. J., Riegelsville—Warren Co., Court House, Belvidere, steel, concrete bridge over Mill River on Riegelsville, extension, to Freeman-Zellers, Easton, Pa., $34,543.

N. Y., Auburn—J. F. Donovan, city engr., Memorial Bldg., City Hall, Canoga Street Bridge over Owasco Outlet and Raceway to Rudke Bros., and Harrington Co., Auburn, $31,000. Noted July 7.

N. Y., Tonawanda — W. G. Hickman, 20 County Hall, Buffalo, 125 ft. concrete, steel bridge over Ellicott Creek, on Delaware Ave., to J. J. Miller & Son, Tonawanda, $65,000. Noted July 3.

O., Akron—Summit Co., Court House, 143 ft. steel truss bridge over Cuyahoga River at Old Portage, to E. J. Landor & Sons, Renkert Bldg., Canton, $55,950. Est. $81,650. Noted July 10.

Oklahoma—State Hy. Dpt., Oklahoma City, 5 span 180 ft. bridge at Atoka, and 3 span 340 ft. bridge at Caney, Atoka Co., to Mackey & Hopper, Liberty Natl. Bank Bldg., Oklahoma City, $25,107 and $27,167 respectively, est. $30,000 each—6 span 308 ft. bridge at Caney, Atoka Co., to G. M. Brown, McAlester, $37,683 est. $43,000—2 span 192 ft. bridge at Walters, Cotton Co., to Ledford & May, Walters, $38,189 est. $45,000—17 span 612 ft. bridge at Guymon, Texas Co., to R. R. Tway, 237 East 15th St., Oklahoma City, $43,492 est. $50,000. Grand total $171,638. Noted July 17.

Pennsylvania — Beaver Co., Court House, Beaver, concrete pylons, parapets of approaches Rochester-Monaca Bridge over Ohio River, to F. W. Scott Co., Hays, $20,240. Noted May 15.

Utah—**State Road Comn., Salt Lake City**, steel and concrete viaduct over Oregon Short Line R.R. to O. Bundy, Weber Co., Ogden, for State, Weber Co. and Oregon Short Line R.R. $22,825. Noted July 24.

Wyoming — State Hy. Comn., Cheyenne, 2 steel bridges, Uinta Co., to G. H. Carruth, Evanston, $36,379. Noted July 14 Daily.

Ont., Brampton—Peel Co., 110 ft. bowstring rein.-con. arch bridge at Clairville, to Kidd & McBride, Inglewood; 90 ft. bowstring arch bridge at Eldorado, to R. A. Blyth, Toronto; grading 4,000 cu.yd., near here, to O'Brien & Keetch, Trenton. Est. $30,000. Noted June 26.

Ont., Toronto—J. W. Harvey, clk. York Twp., 44 ft. rein.-con. bridge, Eglinton Ave., to Rayner Constr. Co., Toronto, $41,900, exclusive of waterproofing and cement work. Noted July 23 Daily.

STREETS AND ROADS

BIDS ASKED

Alabama—Aug. 26, by State Hy. Comn., W. Finnell, hy. dir., Montgomery, grading, surfacing 9.54 mi. F.A.P. 211, Baldwin Co.; 14.63 mi. F.A.P. 213, Marion Co.

California—Aug. 13, by C. H. Purcell, engr., State Hy. Comn., Sacramento, grading, oil treated crushed gravel or stone on crusher run base surfacing 1 mi. Newcastle Rd., also 531 ft. tunnel, Placer Co.—37.9 mi. Cuyama River Rd., San Luis Obispo Co.—heavy fuel oil furnished, applied to shoulders 8.4 mi. La Posta-Tecate Divide, San Diego Co.—grading, concrete paving 3.3 mi. Seal Beach-Sunset Beach Rd., Orange Co.—grading, concrete and bituminous macadam paving 3.1 mi. Anaheim Street-Seal Beach Rd., Los Angeles Co.

California — C. H. Purcell, engr., State Hy. Comn., Sacramento, rejected bids July 16, grading, crushed rock or gravel surfacing 1.4 mi. Alturas Rd., Modoc Co.; macadam surfacing 35 mi. La Moine-North Boundary Rd., Shasta Co. Will readvertise. Noted July 3.

Calif., Bell—Aug. 15, by City Council, curbing, guttering, sidewalks, oil macadam surfacing, grading 125,000 sq.ft. Loma Vista Ave.

Calif., Gilroy—City rejected bids grading, asphaltic concrete paving Hanna St., et al. Noted July 13.

Calif., San Bernardino — Aug. 18, by City Council, curbing, walks, sewers, 6 in. concrete paving 120,641 sq.ft. L St. A. B. Lowe, city engr.

Calif., South San Francisco—Aug. 18, by D. McSweeney, city clk., grading, curbing, walks, guttering, 2 in. asphaltic concrete on asphaltic concrete and 3 in. waterbound macadam paving Linden Ave., et al. $95,000 or more. G. A. Kneese, Court House, Redwood City, engr.

Ill., Chicago—Aug. 11, by Cook Co. Comrs., County Bldg., rein.-con. paving Southwest Highway, Potter Rd., Central, and Touhy Aves., 95th and Madison Sts. G. B. Quinlan, 121 West Wacker Dr., engr.

Ind., Crown Point—Aug. 11, by Bd. Comrs, Lake Co., improving F. C. McLaughlin Rd., $89,120. W. E. Whitaker, Crown Point, aud.

Ind., Mt. Vernon—Aug. 11, by Comrs. Posey Co. graveling 15,830 ft. J. M. Hall Rd. $14,496. 12,300 ft. G. P. Jones Rd. $8,370, 5,280 ft. Edwin Stein Rd. $7,140, 5,338 ft. Jas. Randolph Rd. $5,469, 5,715 ft. Earl DeFur Rd. $5,371, 2,675 ft. Wm. Eshe Rd. $3,294. W. C. Walker, Mt. Vernon, aud.

Ia., Guthrie Center—Aug. 12, at office Auditor Guthrie Co., graveling 5.5 mi. trunk roads, A. McKeel, Guthrie Center, co. engr.

Kansas—Aug. 19, by State Hy. Comn., Court House, St. Marys, concrete paving 1.491 mi. U. S. Hy. 40, F.A.P. 355 H. Pottawatomie Co. W. V. Buck, Topeka, hy. engr.

La., Bastrop—Aug. 19, by Police Jury Morehouse Parish, graveling 3.5 mi. Point Pleasant Hy. L. White, Bastrop, engr.

Maryland—Aug. 12 by State Roads Comn., Baltimore, alternate bids hot and cold bituminous mix, resurfacing 3.97 mi. Contr. B-160-411, Baltimore Co.—concrete shoulders 2.1 mi. Contr. P-132-311, Prince George's Co.—6.41 mi. Contr. Ce-93-211, Cecil Co.—4.79 mi. Contr G-40-611, Garret Co.—10.33 mi. Contr. K-53-211 Kent Co. —concrete paving 1.87 mi. Contr. P-27-34, Prince George's Co.—gravel surfacing 3.84 mi. Contr. P-129-32 Prince George's Co. H. Williar, Federal Reserve Bank Bldg., Baltimore, engr.

Md., Baltimore — Aug. 13 by Bd. Awards, concrete paving 10,650 sq.yds. streets. Contr. 550. N. L. Smith, Municipal Bldg., hys. engr.

Massachusetts—Aug. 12, by Dpt. P. Wks., Boston, gravel and bituminous macadam paving 7,100 ft. hy. Franklin—10,900 ft. Merrimac—4,885 ft. Sterling—gravel and bituminous mac-

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Streets and Roads (Continued)

adam paving and constructing rein.-con. bridge on 2,300 ft. hy., Bellingham and Mendon—bituminous macadam paving 7,100 ft. Agawam—6,500 ft. Dighton—2,400 ft. Greenfield. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Boston — Aug. 7, by Dpt. P. Wks., J. A. Rourke, comr., City Hall, recut granite block paving Green St., Ward 3. $25,000.

Mass., Chelsea (br. Boston) — Aug. 8, by Street Dpt., City Hall, concrete paving Garfield Ave. $40,000. G. O'Brien, City Hall, in charge.

Mich., Ferndale—Aug. 8, by J. F. Gibbs, city mgr., 22748 Woodward Ave., curbing, guttering, 8 in. concrete paving 21,000 sq.yd. $45,000.

Minn., Minneapolis—Aug. 18, by A. P. Erickson, aud. Hennepin Co., grading, extending Project 2904, University Ave. N. E. between 37th Ave. N. E.—north village limits of Columbia Heights: 37th Ave. N. E. to Rice Creek. $50,000. W. E. Duckett, Court House, co. hy. engr.

Miss., Batesville—Aug. 11, by Bd. Supervs. Panola Co., graveling 2.5 mi. Batesville-Mt. Olivet Rd.—1 mi. Curtis Rd.—2.04 mi. Pope and Crowder Rd.—4 bridges.

Mo., Clayton — Aug. 15, by St. Louis Co., County Court, concrete paving Woodson Rd., Natural Bridge St., Page, Florissant and Lockwood Aves. R. Jablonsky, Court House, co. engr.

Mo., St. Louis—Aug. 19, by Bd. P. Serv., concrete paving 14,000 sq.yd. in alleys in City Blocks 2872, 3895, 5533, 2913, 4091, 4892, 4142, 5313N, and 5488, $38,855; concrete sidewalks, $15,870. W. W. Horner, city engr.

Mo., St. Louis — Aug. 26, by Bd. P. Serv., asphaltic concrete paving 6,215 sq.yd. Nashville and Labadie Sts., $36,120 — warrenite paving 12,840 sq.yd. Tholozan, Palm and Humphrey Sts., $82,720—rein.-con. paving 2,535 sq.yd. Kraft St., $11,440— vibrolithic concrete paving 6,846 sq.yd. Limit Ave., Gimblin, 13th, Papin Sts. $71,120. W. W. Horner, city engr.

Mo., St. Louis—Sept. 2, by Bd. P. Serv., City Hall, warrenite bitulithic paving 7,100 sq.yd. Bent Ave. and Mimika St. $43,840—asphalt paving 16,750 sq.yd. Temple Pl., Itaska St., and Bingham Ave., $37,460—grading, concrete paving 9,000 sq.yd. alleys in City Blocks 4141, 4517N, 5339, 5646, 5363, 5364, and 5835. $25,000. W. W. Horner, city engr.

New Jersey—Aug. 11, by State Hy. Comn., Trenton, grading, granite block on concrete paving 3.650 sq.yd. Route 10, Sect. C. Contr. 35, Kearny, Hudson Co. A. L. Grover, ch. clk.

New Jersey—Sept. 3, by State Hy. Comn., Trenton, grading, 10 in. rein.-con. paving 111,573 sq.yd. Routes 1, 4 and 6, Sect. 6, Christie's Lane to Hudson River, Bridge Plaza, Bergen Co. A. L. Grover, ch. clk.; adv. E. N.-R. Aug. 7.

N. J., Ridgefield Park—Aug. 12, by Bd. Village Comrs., 232 Main St., curbing, sidewalks, amiesite paving Main St. $25,000. D. C. Boswell, village engr.

N. Y., Brooklyn—Aug. 13, by H. Hesterberg, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, flagging, Avenue W, East 14th, Whitney and Voorhees Aves., grading, bituminous concrete surfacing Avenues, P, T, L and O, East 36th, Coleman, Hendrickson, Kimball, Ryder, East 48th, East 52nd, East 54th, East 55th, East 56th, East 57th Sts.

N. Y., Cortlandt — Aug. 18, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, grading 0.9 mi. Bronx Parkway extension from Main St. to Crompond Rd. J. Downer, Bronxville, ch. engr.; adv. E. N.-R. Aug. 7.

N. Y., Long Island City—Aug. 11, by G. U. Harvey, pres. Queens Blvd., Boro, Queens Subway Bldg., temporary bituminous macadam paving Sutphin 165th St.—grading, curbing, sidewalks, granite block on concrete paving Skillman Ave.—grading, sheet asphalt on concrete paving 97th Pl., 51st, 55th, 115th and 114th Aves., 82nd, 83rd, 108th, Main, 124th, 120th, 121st, 122nd, 123rd, 142nd and 143rd Sts.

N. Y., New York—Aug. 12, by W. J. Flynn, acting, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks, Eastern Blvd., Fetley and Matthews Aves., grading, sheet asphalt on concrete paving Yates and Liebig Aves., East 162nd and East 183rd Sts.

N. Y., St. George—Aug. 13, by J. A. Lynch, pres. Richmond Boro, Boro Hall, grading, bituminous macadam paving Railroad and Delafield Aves., grading, Stevenson Pl.

N. Y., Syracuse—Aug. 11, by Bd. Contr. & Supply, resurfacing Valley Dr. and Seneca Turnpike. $152,300. W. Cronin, state Tower Bldg., engr.

O., Parma—Aug. 8, by Village, paving Stanbury, Lorimer and Dresser Aves. To exceed $25,000.

Pennsylvania—Aug. 15, by State Hy. Dpt., Harrisburg, improving 27 mi. roads, in Armstrong, Beaver, Berks, Erie, Fayette, Greene, Indiana, Jefferson, Lawrence, Lehigh, Northampton, McKeen, Mifflin, Montgomery, Northumberland, Perry, Schuylkill, Carbon Luzerne, Snyder, Union and Westmoreland Counties; bridges in Huntingdon, Lawrence, Lehigh, Northampton, and Snyder Counties. J. L. Stuart, secy.; adv. E. N.-R. Aug. 7.

Pa., Donegal—Aug. 8, by W. A. Guess, secy. Bd. Supervs. Donegal Twp., R.D. 1, West Alexander, improving 3 mi. West Alexander-Dunsford Rd., incl. 300 tons air cooled slag.

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Pa., Glassport—Aug. 11, by Borough Council, grading 4 streets also storm and sanitary sewer in Indiana Ave. A. Hutchinson, borough engr.

Pa., Glassport—Aug. 11, by N. J. Chaverini, secy., 725 Michigan Ave., 4 in. brick on 6 in. concrete paving 0.25 mi., 8 in. rein.-con. paving 0.13 mi. Indiana Ave., 2nd, 3rd, 4th and 9th Sts., also 600 ft. 12 in. vitr. sewer pipe. A. Hutchinson, Boro Bldg., Swissvale, engr.

Pa., Meadville—Aug. 12, at office G. S. Maxwell, city clk., City Bldg., sheet asphalt, brick and fibre brick paving; also widening, curbing, guttering, Park Ave. R. L. Phillips, city engr.; adv. E. N.-R. Aug. 7.

Pa., Phila.—Aug. 12, by Dpt. P. Wks., A. Murdock, dir., City Hall, Annex, asphalt repaving and redressed granite block paving County Bd. Improvement.

Pa., Sharpsville—See "Contracts Awarded."

South Dakota—Aug. 14, by State Hy. Comn., at office County Auditor, Huron, paving F.A.P. 31, reopened, Beadle Co. M. A. Kennedy, Pierre, secy.

South Dakota—Aug. 15, by State Hy. Comn., at office Auditor, Sioux Falls, grading, graveling, concrete paving F.A.P. 135-A, reopened, Minnehaha Co. M. A. Kennedy, Pierre, secy.

Tennessee—Aug. 15, by State Dpt. Hys. & P. Wks., Nashville, grading, drainage structures 5.4 mi. Ashland City-Bellsburg Rd., Cheatham Co.—9.8 mi. Spring City-Roane Co. line Rd., Hy. 29, Rhea Co., incl. slab bridge over 20 ft. span—7.2 mi. Centerville Rd., Hy. 100, Hickman Co., incl. 5 bridges over 20 ft. span—5.5 mi. Trace Creek-Hohenwald Rd., Hy. 48, Lewis Co., incl. bridge over 20 ft. span— 18 mi. Lincoln Co. Line-Winchester Rd., Hy. 15, Franklin Co., incl. 2 bridges — paving 14.6 mi. Morgan Co. Line-Helenwood Rd., Hy. 29 Scott Co.—7 timber, steel bridges on Hy. 57, McNairy Co. R. H. Baker, hy. engr.

Tex., Dallas—Sept. 4, by C. E. Gross, aud. Dallas Co., grading Bruckner Blvd. Extension between Comrs. Dist. line 2 and intersection Northwest Hy. Rollins & Clinger, Records Bldg., dist. engrs.

Tex., Houston—Aug. 20, by H. L. Washburn, aud. Harris Co. and W. E. Monteith, city mayor, at office City Secretary, paving Yale St. between north line Washington Ave. and north line 22nd St.

Tex., Karnes City—Aug. 18, by Comrs. Karnes Co., grading 10.5 mi. Dist. 1. $70,000. J. V. Curnutte, Karnes City, resident engr.

Tex., Port Arthur—Aug. 12, by City, c/o P. W. O'Neal, mayor, surface treating 460,000 yd. W. O. Bower, Port Arthur, engr.

Tex., San Saba—Taking bids alternate types paving. $75,000. R. Willard, San Saba, and 5505 Belmont St., Dallas, engr.

Virginia—Aug. 12, by State Hy. Dpt., Richmond, grading 0.35 mi. Route 12, Project F-20-BB Southampton Co.—0.4 mi. Route 10, Project F 333-C, Nansemond Co.—0.5 mi. Route 17, Project F 637-AB1, Botetourt Co.—paving 1 mi. Route 10, Project S 666-A, Bedford Co.—macadam surfacing 0.5 mi. Route 204, Project S 666-C, Bedford Co. $100,000. H. J. Spallman, ch. engr.

Washington—Aug. 19, by State Hy. Comn., Olympia, crushed graveling 12,500 cu.yd. State Rd. 9, Clallam Co.; grading 0.3 mi. State Rd. 3, Spring Flat Creek Bridge, approaches, Whitman Co. S. J. Humes, dir.

W. Va., Charleston—Aug. 14, by Bd. Comrs. Kanawha Co., concrete paving 3 mi. Cedar Grove-Ward Rd., 16 ft.—2 mi. Dunbar-Sattes Rd. 16 ft.—stone surfacing Tuppers Creek-Johnson Rd.—grading 3 mi. Cabin Creek Rd.—90 ft. steel superstructure Rich Fork Bridge over Kanawha River. R. N. Moulton, co. clk.

W. Va., Middlebourne — Aug. 28, by Court Tyler Co. gravel or slag surfacing 1.75 mi. Slicker Rd.—1.75 mi. Point Pleasant Rd.—1.75 mi. Elk Fork Rd.—slag surfacing 1.5 mi. Pratt Run Rd.—400 lin.ft. Shirley Rd.—3.4 mi. Big Run Rd.—bituminous retread surfacing 2.66 mi. Wick Rd.—28 ft. span concrete slab bridge on McElroy Creek Rd.—7 ft. span concrete box culvert on Pratts Run Rd. G. R. Clark, Middlebourne, engr.

W. Va., Moundsville—Aug. 14, by Bd. Comrs. Marshall County Court, graveling 5 mi. Lynn Camp and 3 other roads, also concrete bridge over Toms River. $25,000. B. W. Brown, Moundsville, engr.

Wa., Va., Wayne—Aug. 15, by Wayne Co. Court, at office H. Adkins, clk., traffic bound, gravel, limestone or slag surfacing 3,777 lin.ft. Whites Creek Co. Rd. Project 135. H. O. Wiles, Wayne, co. engr.

Wisconsin — Aug. 15, by State and Dane, Green and Columbia Counties Hy. Comns., Madison, concrete paving 1.756 mi. Stoughton-Madison-Portage Rd., U. S. Hy. 51, F. A. P. 460-D, and 1 mi. Brooklyn Rd., S. T. Hy. 92, S. A. P. 1339.

Wisconsin — Aug. 12, by State and Monroe Co. Hy. Comns., LaCrosse, concrete paving 4.58 mi. Tomah-Millston Rd., U. S. Hy. 12, F. A. P. 396-A.

Wisconsin — Aug. 13, by State and Calumet Co. Hy. Comns., Green Bay, grading, concrete surfacing 9.15 mi. Manitowoc-Appleton Rd., S. T. Hys. 10, 55, 114, S. A. P. 3359, 3355 and F. A. P. 424-C.

Wisconsin—Aug. 14, by State, Washington and Fond du Lac Co. Hy. Comns., Commerce Bldg., Milwaukee, grading, concrete paving 3.4875 mi. S. T. Hy. 44, S. A. P. 2973, and 0.177 mi. U. S. Hy. 41, S. A. P. 2974.

Wis., Superior—J. L. Banks, city engr., soon takes bids asphalt paving 7th, 8th, 11th, 14th and 17th Sts., for City.

Alberta—Aug. 8, by J. D. Robertson, deputy minister P. Wks., Edmonton, grading 195,000 cu.yd. Project 43.8; 100,000 cu.yd. Project 25-A.

Ont., Toronto — Aug. 12, by B. S. Wemp, mayor, City Hall, asphalt on concrete paving Wanless Crescent, Willowbank Blvds, and 3 avenues; bitulithic on concrete paving Chaplin Crescent, Tilson Rd. and 4 avenues; concrete paving 2 lanes. $150,000.

CONTRACTS AWARDED

Calif., Los Angeles—Grading, curbing, walks, concrete paving 117th St. and Dunbar Impvt. Dist., to G. H. Oswald, 366 East 58th St., $149,370.

Calif., Los Angeles—Los Angeles Co., grading, curbing, walks, concrete and asphaltic concrete paving Virgil Ave. between Sunset Blvd. and Geneva St., to G. H. Oswald, 366 East 58th St., $120,348.

Calif., Martinez—Contra Costa Co., emulsified asphalt surfacing 7 mi. Lone Tree Rd., to U. B. Lee, 888 Rodney Dr., San Leandro, $26,355.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, sewers, water mains, connections, curbing, guttering, 8 in. concrete paving 5,641 sq.ft., 6 in. concrete paving 4,093 sq.ft., durite process on asphaltic concrete surfacing 57,637 sq.ft. 256th St., to G. H. Oswald, 366 East 58th St., $29,565 est. $30,312; grading, curbing, guttering, sewers, water connections, 4, 6 and 8 in. concrete paving 162,726 sq.ft. Western Avenue Impvt., to Los Angeles Paving Co., 3200 East Vernon Ave., $117,290.

Calif., Oakland—Grading, macadam surfacing roadway at 9th Ave. Pier, to L. J. Immel, 1031 Evelyn Ave., Berkeley, $32,548.

Calif., San Mateo—Grading, curbing, guttering, walks, asphaltic concrete paving 23rd, 24th et al. Aves., to Hanrahan Co., Standard Oil Bldg., San Francisco, $37,625.

Calif., Stockton—San Joaquin Co., grading, culverts, surfacing Bacon Island Rd., incl. 37,000 cu.yd. excav., 7,000 tons base and 5,100 tons top course surfacing, to G. French, Jr., P.O. Box 675, $33,658.

Ill., Bethalto—Grading, concrete paving 13,250 sq.yd. Mills and Prairie Sts., to Krebs Constr. Co., Edwardsville, $27,995. Est. $36,639.

Ill., Edwardsville—Grading, concrete paving 17,670 ft. Sect. 47, M.F.T., 18 ft. and 6 ft. earth shoulders, to Edwardsville Constr. Co., Edwardsville, $67,915.

Iowa — State Hy. Comn., Ames, grading, flumes, paving 3.833 mi. P. 537 and 7.378 mi. P. 179, Guthrie Co., to C. P. Lytle Constr. Co., 504 Nebraska St., Sioux City, $39,002 and $100,993 respectively—1.628 mi. Harrison Co., to Roberts Constr. Co., 404-5 First Natl. Bldg., Lincoln, Neb., $30,001—1.439 mi. Kossuth Co., to E. L. Royer Constr. Co., Valley Junction, $24,190—grading 0.72 mi. Hamilton Co., to W. Dutton, Boone, $6,334—10.447 mi. Howard Co., to D. R. Caldwell, 3871 Furman St., Omaha, Neb., $50,375—3.334 mi. Monona Co., to G. W. Condon Co., 223 Grain Exchange Bldg., Omaha, Neb., $70,510—graveling 14 mi. Fremont Co., to McDougall Constr. Co., Sioux City, $30,030—guard rail in Dist. 6 various counties, to G. Cronkrite, Perry, $14,594. Grand total $366,029. Noted July 3.

Ia., Clinton—Clinton Co., gravel or crushed rock surfacing 6.54 mi. Project 10, to A. A. Hurst, Maquoketa, 5,200 cu.yd. crushed rock at $1.96 per cu.yd., and 7.34 mi., incl. 5,900 cu.yd. at $1.86; graveling 9 mi. Project 12, incl. 7,200 cu.yd. gravel, to M. Baker, Olin, at $1.05.

Ia., Council Bluffs—Pottawattamie Co. grading county trunk road system, to E. J. Wilson & Son, Omaha, Neb., $28,077.

Kansas — State Hy. Dpt., Court House, Emporia, chats paving 14.203 mi. Kiowa Co. to M. W. Watson, Mulvane Bldg., Topeka, $18,578—7.328 mi. Stafford Co. to C. Hume, Great Bend, $7,616—7.924 mi. Sumner Co., to W. F. O'Brien, St. Paul, $13,787—14.319 mi. Sumner Co. to Cook & Cone, Ottawa, $22,594—10.92 mi. Sumner Co. to Koehler Constr. Co., Sterling, Neb., $21,816—bridge in Rice Co. to Thomartin & Reis, Fort Scott, $4,454. Grand total $88,845.

Kansas — State Hy. Dpt. Topeka, grading, culverts 4.108 mi. roads in Elk Co., to A. L. Cook, Ottawa, $26,676—3.499 mi. Federal Aid Project 418-A and 6.573 mi. Sect. B, to D. Scherrer, 329 North 18th St., Kansas City, $43,626 and $45,452 respectively—9.087 mi. Greenwood Co., to Kipler Bros., Kansas City, $56,062—concrete slab surfacing 0.823 mi. Linn Co., to J. A. Lakin, Kansas City, Mo., $40,697—0.873 mi. Montgomery Co., to A. G. Sherwood, Independence, $25,027—2.05 mi. Labette Co., to Brasnahan Bros., Kansas City, Mo., $61,588. Grand total $299,128. Noted July 10.

Kansas — State Hy. Dpt., Topeka, grading, culverts 3.289 mi. roads in Cowley Co., to J. W. Gaston, Larned, $58,811 — Ensley Co., to E. Graff, Newton, $32,972—Harvey Co., to R. Sanford, Wellington, $25,346; Grand total $117,129.

Kentucky—State Hy. Dpt., Frankfort, light tar surfacing 1.707 Whitley City-Tennessee State Line Rd., Federal Aid Project 170-D.S. McCreary Co., to Carey-Reed Co., Lexington, $33,682.

Streets and Roads (Continued)

La., Alexandria—Rapides Parish Police Jury, graveling 17 mi. Bennett Landing, Gross and Blue Lake Rds., to Leathers & Martin, Alexandria, $25,795. Noted June 12.

Maryland — State Roads Comn., Baltimore, concrete paving 1.3 mi. Harford Co., to Harry T. Campbell & Sons Co., Towson, $52,549 — concrete sidewalks on 0.7 mi. Prince George Co., to Victor A. Pyles Co., Brooklyn, $4,539— concrete shoulders on 3.31 mi. hy. in Anne Arundel Co., to Christhilf & Ensey Co., 1625 Ridgely St., Baltimore, $16,736—15.1 mi. Prince George Co., to Highway Eng. & Constr. Co., 7th and T Sts. N. E., Wash., D. C., $63,054—penetration macadam paving 2.1 mi. Prince George Co., to H. E. Gosnell & Co., Frederick, $20,540—sheet asphalt paving 0.57 mi. Baltimore Co., to P. Flanigan & Sons, Harford Rd. and Baltimore & Ohio R.R., Baltimore, $64,794. Grand total $222,212. Noted July 17.

Maryland — State Roads Comn., Baltimore, penetration macadam resurfacing 3.18 mi. Harford Co., to T. B. Gatch Building & Constr. Corp., Belair Rd., Baltimore, $51,016; graveling 2 mi. St. Marys Co., to Jarboe & Houghton, Mechanicsville, $12,275.

Maryland — State Roads Comn., Baltimore, Concrete paving 2 mi. Contr. CO-58-24, Caroline Co., to Hannemann-Burroughs Co., Salisbury, $27,793—concrete shoulders 7.41 mi. Contr. Ho-66-51, Howard Co., to Thomas, Bennett & Hunter, Westminster, $44,476—1.56 mi. Contr. AA-96-711, Anne Arundel Co., to Christhilf & Ensey Co., 1625 Ridgely St., Baltimore, $7,557—5 mi. Contr. A-76-611, Allegany Co., to G. F. Hazelwood, Cumberland, $34,721—2 mi. Contr. M-157-311, Montgomery Co., to J. P. Maher, 2108 K St., N.W., Wash., D. C., $13,242. Grand total $127,789. Noted July 24.

Maryland — State Roads Comn., Baltimore, concrete shoulders, 1.2 mi. Contr. M-152-311, Montgomery Co., to Loomis Constr. Co., 1013 Wisconsin Ave., Baltimore, $14,609. Noted June 19.

Maryland — State Roads Comn., Baltimore, concrete paving 4.53 mi. Contr. GE-80-28, Cecil Co. to P. D. Phillips Bro., Salisbury, $99,539. Noted July 10.

Md., Towson — Comrs. Baltimore Co., Court House, concrete paving 0.84 mi. Group 8, to Maloney Bros., 1111 Rutland Ave., Baltimore, $21,364. Noted July 17.

Massachusetts—Dpt. P. Wks., State House, Boston, bituminous macadam paving 2,880 ft. Easthampton, to A. G. Bianchi & Co., 98 Lincoln Park, Longmeadow, $21,860—7,231 ft. Revere and Saugus, to M. McDonough, Saugus, $14,460—3,490 ft. Avon, to J. A. Silver, 259 East High St., Avon, $18,283—1,300 ft. Medway, to Middlesex Constr. Co., 24 Union Ave., Framingham, $13,309—10,019 ft. Southwick, to Lane Constr. Corp., 134 State St., Meriden, Conn., $49,016—11,689 ft. Winchendon, to John Iafolla Constr. Co., 298 East St., Dedham, $46,114—3,400 ft. Hanover and Pembroke, to A. K. Finney, Plymouth, $23,082. Grand total $186,124. Noted July 17.

Massachusetts—Dpt. P. Wks., State House, Boston, 43 rein.-con. paving 11,450 ft. hy. North Attleboro, to B. Perini & Sons, Inc., Ashland, $269,800 — bituminous macadam paving 6,000 ft. South Hadley, to Warner Bros. & Goodwin, Sunderland, $34,651—2,319 ft. Holden, to Frank & Frank Constr. Co., 9 Doyle Ave., Providence, R. I., $10,637—3,300 ft. Charlton, to R. H. Newell Co., Uxbridge, $16,908—gravel and bituminous macadam paving 3,314 ft. Newbury, to Welch & Moynihan, 15 Front St., Salem, $10,304. Grand total $342,300. Noted July 24.

Massachusetts—Dpt. P. Wks., State House, Boston, rein.-con. paving 28,447 ft. Hys. in Shrewsbury, Northboro and Westboro, Sect. B, Boston-Worcester Turnpike, to C. Bianchi & Co., Framingham, $1,005,044. Noted July 24.

Mass., Boston—Dpt. P. Wks., bituminous paving Fisher Ave., Ward 10, to C. Struzziery, 115 Kittredge St., West Roxbury, $34,955; sheet asphalt paving Marcella St., Ward 11, to M. F. Gaddis, 6 Beacon St., $25,463. Noted July 17.

Mass., Newton — Simpson vulcanized paving Grove St. and 16,852 cu.yd. West Newton Sect., to Simpson Bros. Corp., 77 Summer St., Boston. Est. exceeds $50,000.

Mass., Taunton — Bitulithic concrete paving Winthrop St., to Washburn & Sheridan, East Taunton, at $2 per sq.yd. Est. $25,000.

Mich., Detroit—Dpt. P. Wks., 7 in. one course concrete paving 30,840 sq.yd. for Airport Hangar Apron 2, Municipal Airport, French and Lynch Rds., to Otis Cement & Constr. Co., 2956 Penobscot Bldg., $50,826. Est. $50,000. Noted July 24.

Minnesota—State Hy. Comn., St. Paul, to Erickson, Johnson & Fraser, 3631 22nd Ave., S., Minneapolis, grading 288,000 cu.yd. S.P. 3-61, $73,578—to A. Guthrie, Builders Exch. Bldg., St. Paul, 350,000 cu.yd. S.P. 8-35, $153,552—to J. J. & M. S. Mergens, 425 Gateway Bank Bldg., Minneapolis, 206,000 cu.yd. S.P. 5-39, Sect. 1, and 183,000 cu.yd. S.P. 5-40, Sect. 1 $150,356; 135,000 cu.yd. S.P. 14-27 $34,144—to C. Weaver, Anoka, 361,000 cu.yd. S.P. 20-25, $193,402; paving 129,000 sq.yd. S.P. 7-42, Divs. A and B, $155,295. Grand total $760,327. Noted July 10.

Miss., Canton—Grading, graveling 8 mi. Road Dist. 1, to Clark & McCaa, Jackson, $20,120. Noted July 3.

Miss., Kosciusko—For 2 in. warrenite on 5 in. concrete paving Jefferson St., to Barber Bros. Constr. Co., Kosciusko, $26,010.

Miss., Oxford—Lafayette Co. improving 3.442 mi. College Hill Rd. and 1.687 mi. Watts Crossing Rd., also bridges at crossings, to E. E. Murray, Oxford, $18,333. Noted July 3.

Miss., Walthall—Bd. Comrs. Separate Road Dist. A, Webster Co., graveling 38.75 mi. 7 roads, to Shruptine & Son, Birmingham, Ala. Noted July 3.

Mo., Boonville—Graveling 17 mi. roads in Palestine Special Road Dist., to H. A. Worman, Pittsfield, Ill.

Mo., Clayton — St. Louis Co., Court House, rein.-con. paving 8,000 sq.yd. and concrete paving 200 sq.yd. Delmar Blvd., to Israel Bros. Constr. Co., 6635 Delmar Blvd., University City, $18,380—9,400 sq.yd. Geyer Rd., to Crean & Scott Constr. Co., 1242 Sublette Ave., St. Louis, $30,122—1,500 sq.yd. Julian Ave., to W. F. Smith & Co., 6635 Delmar Blvd., University City, $4,065—2,068 ft. Ravenwood St., to H. B. Dawson, 6734 Scanlon Ave., St. Louis $21,470. Grand total $74,037. Noted July 17.

Mo., Kansas City—Paving Brooklyn St., to Midwest Paving Co., 25th and Summit Sts., $42,814; 26th St., to Gray Paving & Material Co., 1914 Highland St., $58,212.

Mo., Kansas City — Jackson Co. paving, bridging 0.471 mi. Blue Ridge Blvd., to H. Spitcaufsky, 3229 Victor St., $49,012.

Mo., St. Louis—Bd. P. Serv., curbing asphalt paving 15,660 sq.yd. McLaran Ave., to C. A. Moreno, Syndicate Trust Bldg., $116,690; 3 in. brick on concrete paving 590 sq.yd. Lee Ave., to W. A. Riley, 706 Chestnut St., $3,994. Noted June 27.

Mo., Speed—Graveling road, to H. A. Worman, Pittsfield, Ill., $21,000. Est. $25,000.

Mo., University City (br. St. Louis)—Widening concrete paving Delmar Blvd. to W. A. Riley Constr. Co., 706 Chestnut St., St. Louis, $29,138.

Nebraska—State Dpt. P. Wks., Lincoln, to Western Asphalt Paving Corp., Sioux City, Ia., paving 6.7 mi. Cass and Lancaster Counties, $145,775; 3.2 mi. Lincoln Co., $79,421; 4 mi. Buffalo Co., $103,876. Grand total $329,072. Noted June 5.

New Hampshire—State Hy. Comn., Concord, gravel surfacing 4.58 mi. hy., Oxford, to J. H. Kerr, Rumford, Me., $61,009. Noted July 10.

N. J., Flemington—Bd. Freeholders Hunterdon Co., Court House, Sect. 2, Readington-North Branch Rd. to Thompson & Frumm, White House, $37,868.

N. J., Newton — Sussex Co., Court House, grading, concrete paving Junction and Fowler Sts., to Culp Constr. Co., East McFarlan St., Dover, using limestone. $15,339. Noted July 10.

N. Y., Buffalo — G. Fisk, comr. Municipal Bldg., to H. P. Burgard Co., 1868 Fillmore Ave., $35,610; Shumway, $41,938; Sherman St., $21,170; Leland St. $13,157; Weaver St., $28,150; and Glenwood Ave., $10,625—to Rock Asphalt Co., Morgan Bldg., asphalt paving Fargo St. $54,700; Busti St., $45,735; Carolina St. $6,260 and 14th St., $4,230. Grand total $261,125.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, asphalt paving Carroll St. to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., $3,657—Kimball St. to D. J. McCoy Asphalt Co., Avenue U and East 57th St., $8,021—grading Fillmore Ave. to J. and M. Moran Excavating Co., 413 Sterling Pl., $1,456. Grand total $13,134. Noted July 3.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, sheet asphalt on concrete paving Van Alst Ave., $23,480; 108th St., $18,671; Crescent St., $44,063; 85th Ave. $16,134; 86th Ave. $4,983; 135th St. $10,412—to Uvalde Asphalt Paving Co., 1 Bway., New York, Lefferts Ave., $22,600; 122nd St. $17,723—to Highway Impvt. & Repair Co., Furman's Island, Brooklyn, Hollis Ave., $5,919—to Flushing Contg. Co., 666 Wyoming Ave., Flushing, grading Homelawn Ave., $983—to Brugel Contg. Co., 1145 Cypress Ave., Ridgewood, grading Van Wyck Blvd., $8,650. Grand total $173,618. Noted July 24.

Ohio—R. N. Waid, dir. State Hys., Columbus, brick paving 2,605 mi. Ross Co., to H. B. Watters, 1039 East Broad St., Columbus, $237,950—concrete paving 6,965 mi. Putnam Co., to J. J. Stambaugh, Ada, $169,191—2,529 mi. Williams Co., to Lynn Constr. Co., Paulding, $90,559—7,499 mi. Wood Co., to S. E. Johnson, Terminal Bldg., Toledo, $287,295—bituminous macadam paving 2.156 mi. Mahoning Co., to E. E. Miller & Son, Canfield, $54,135. Grand total $839,130.

O., Akron—F. E. Swineford, dir. P. Service, grading, curbing, sidewalks, boulevard lighting system, vitr. brick on 6 in. concrete paving 9,250 sq.yd. Delaware and Huse Aves., to Louis Crano, Inc., 605 Peoples Savings & Trust Co., $60,831. Noted July 24.

O., Akron—F. E. Swineford, dir. P. Serv., grading, concrete, limestone aggregate paving 5,600 sq.yd. Airport Service Rd., 18 ft. to McShaffrey Constr. Co., 173 South Forge St., $21,036. Noted June 26.

O., Bowling Green—Comrs. Wood Co., grading, waterbound macadam paving 8,540 ft. George Christen Rd., 18 ft., to Van Wagner Constr. Co., Bowling Green, $34,032.

O., Parma (br. Cleveland)—Concrete paving Milford Ave., to Loesch & Green Constr. Co., Ridge Rd., Cleveland, $25,714—North Ave., to Freshwater Constr. Co., Davis & Farley Bldg., Cleveland, $39,621—West 46th St., to W. E. McHugh, West 73rd St. Wheeling & Lake Erie Tracks, Cleveland, $13,399. Grand total $78,734.

O., Portsmouth — C. A. Harrell, city mgr., sheet asphalt resurfacing 8th St. between Gallia and Campbell Sts., to Swingle & Robinson, Columbus, $23,512.

O., Toronto—Brick on concrete paving Henry St., Wentworth and Madison Aves., to F. A. Smoger, Steubenville, $25,769.

Okla., Tulsa—Grading, curbing, paving Street Impvt., Dist. 1049, to Standard Paving Co., 2611 East 11th St., $36,747.

Ore., Portland—Grading, paving East Burnside St., to Edelesen Weygandt & Co., Portland, $62,214 — Front St., to Parker Schram Co., Couch Bldg., $172,689—Speon Ave., to Kern & Kibbie, 290 East Salmon St., $146,500. Grand total $381,403.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, bituminous surface treated macadam surfacing 8,823 sq.yd. roads in Clinton Co., to Jones Constr. Co., Bridgeville, $139,751—15,501 sq.yd. Northumberland Co., to Murphy Bros., Harrisburg, $52,852—79,624 sq.yd. Potter Co., to Fort Pitt Constr. Co., Pittsburgh, $194,476—5,614 sq.yd. Huntington Co., to L. M. Hutchinson, Orbisonia, $22,405—grading, concrete surfacing 34,500 sq.yd. Berks Co., to W. R. Wolfinger, Norristown, $153,729. Grand total $563,213. Noted July 3.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, concrete surfacing 13,000 sq.yd. Fayette Co., to E. H. Canon, Jenkins Arcade, Pittsburgh, $178,436—48,800 sq.yd. Wyoming and Susquehanna Counties, to J. P. Whelen, Leighton, $234,204—15,300 sq.yd. Washington Co., to P. DeRienzo, Fayette City, $86,244—25,800 sq.yd. Forest Co., to Jamieson & Knapp, Fredonia, $139,552 — 24,000 sq.yd. Allegheny Co., to Corrado & Galiardi, Connelsville, $273,197—17,100 sq.yd. Lancaster Co., to W. R. Wolfinger, Norristown, $75,439—6,990 sq.yd. Schuykill Co., to C. Riebe, Lansford, $40,694—26,100 sq.yd. Delaware Co., to Mazzola & Marano, 729 South 7th St., Phila., $174,325—16,200 sq.yd. Somerset Co., to Rankin Constr. Co., Uniontown, $293,516 — 21,100 sq.yd. Lycoming Co., to Good Roads Constr. Co., Williamsport, $125,571—8,245 sq.yd. Armstrong Co., to W. B. H. Williams, Patton, $55,073—93,900 sq.yd. Mercer and Crawford Counties, to H. Okes, St. Paul, Minn., $482,565—grading, bituminous surface treated macadam surfacing 40,248 sq.yd. Dauphin and Lebanon Counties, and 11,600 sq.yd. Adams Co., to Continental Constr. Co., Knickerbocker Bldg., Baltimore, Md., $77,014 and $25,698 respectively—7,680 sq.yd. Center Co., to J. L. Wilson, State College, $22,317—23,220 sq.yd. Snyder and Juaniata Counties and grading, concrete surfacing 13,000 sq.yd. Fayette Co., to York Eng. & Constr. Co., York, $128,742 and $83,298 respectively. Grand total $2,495,885. Noted June 12.

Pa., Brookside Farms—Freehold Real Estate Co., grading and paving real estate development near Brookside Farms, Allegheny Co., to A. F. Jordano & Co., 1201 West Liberty Ave., Pitts-

Pa., Johnstown—G. W. Griffith, supt. Streets & P. Impvts., curbing, guttering, 19 in. rein.-con. paving 11,037 sq.yd. Conemaugh St. and Hillside Blvd., incl. 1,653 lin.ft. 4 in. concrete sidewalks, to Windber Constr. Co., Windber, $57,934. Noted July 17.

Pa., Phila.—Bureau Hys., Dpt. P. Wks., A. Murdock, dir., City Hall Annex, to Morissey Bros., 4336 North Marshall St., grading Bernard, Brighton, Disston, Longshore and Sackett Sts., $8,520; H St., $4,912—to M. Masse, 3936 North Reese St., Claridge and Howland Sts., $1,484—to J. Herzog, 4314 Old York Rd., Herman and Pastorius Sts., $712 and $710 respectively—to Barber Asphalt Co., Hunting Park Ave. at E St., asphalt paving (assessment work) Oxford St., $1,280—to Union Paving Co., Broad and Stiles Sts., 52nd St., $8,251; redressed granite block paving (assessment work) Ryan St., $3,589; grading, paving (assessment work) Oxford St. $18,864; improving Pennaway, St. Vincent and Whitaker Rds., $12,751; redressed granite block repaving Norris St., $34,250; 3rd St., $30,707; 10th St. track area, $12,947—to Municipal Constr. Co., Washington Square Bldg., asphalt paving Boynton St. $13,159; Elmwood St. $15,325; Rittenhouse St. $9,586—to Eastern Asphalt Co., Penna Bldg., Haines St. $33,720; Luzerne St. $4,738. Grand total $221,505. Noted July 17.

Pa., Pittsburgh—Grading, drainage structures, sewers Perry High School Athletic field, Perrysville Ave. and Semicir St., to Monaghan & Barr Co., 4800 Penn. Ave., $36,050.

Pa., Sharpsville—Concrete paving 1,995 ft. 7th St., day labor. $45,000. Soon takes bids for materials as soon as bonds are sold. G. W. Nichols, 28 Silver St., Sharon, engr.

Pa., Waynesburg—Greene Co. improving 7,248 ft. road southerly to Clarksville Boro Line, Morgan Twp., incl. furnishing, spreading, rolling in place 3,500 tons air cooled slag, Penna. 5, and 1,050 tons limestone screenings, Penna., 1, to R. Ferman, Waynesburg, $14,800. Noted July 10.

Rhode Island—State Hy. Comn., Providence, rein.-con. paving 6 mi. Johnston-Scituate Hy., 40 ft., to M. A. Gammino Constr. Co., Providence, $410,517—bituminous macadam paving 2.3 mi. Hopkinton, 20 ft., to Lawton Constr. Co., 79 Lenox Ave., Providence, $54,357—1.7 mi. Cumberland, 20 ft., to T. J. Quinn & Son, 103 Mendon Rd., Ashton, $97,541. Grand total $562,415.

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Streets and Roads (Continued)

Tennessee—State Dpt. Hys. & P. Wks., Nashville, grading, drainage structures 7.161 mi. State Hy. 74, State Aid Project 310-C, Polk Co., to Sutton Bros., Nashville, $182,104.

Tex., El Paso—H. Roach, secy., 5 m.g. earth, concrete reservoir at Ft. Boulevard and Kentucky St., to J. B. McCrary Co., Dallas and El Paso, $71,200.

Tex., Houston—Harris Co., grading concrete paving 3.7 mi. Wallisville and Oats Rds., 20 ft. to Russ Mitchell Inc., 701 Petroleum Bldg., $115,022. Noted July 21.

Tex., Livingston—For 7 in. rein.-con. paving 32,200 yd., to F. P. McElwrath, Corsicana, $82,000.

Tex., Spearman—C. D. Cook, mayor, asphaltic concrete and brick paving 11,294 sq.yd., to L. H. Lacy Co., Burt Bldg., Dallas. Est. $30,000. Noted July 17.

Tex., Victoria—Asphalt on concrete paving 12 blocks Rio Grande St., to Brown & Root, Post Dispatch Bldg., Houston, $51,632.

Utah—State Rd. Comn., Salt Lake City, resurfacing 14.51 mi. road in Sanpole and Seriver Counties to Wheelwright Constr. Co., Ogden, $24,418—and 10.3 mi. in Carbon Co. to E. C. Lee & Son, Price, $22,381.

Utah—J. D. Wood, comr. P. Wks., Salt Lake City, grading, surfacing 7.31 mi. Clark Co., to W. Hoops, Twin Falls, Idaho, $51,778. Est. $55,135.

Vermont — State Hy. Comn., State House, Montpelier, rein.-con. paving 1.8 mi. Middlesex-Montpelier Hy., to D. S. McGrath, Centre St., Adams, Mass., $92,448. Noted June 24.

Virginia—State Hy. Dpt., Richmond, clearing, grubbing, grading, drainage structures, one course macadam surfacing 5.386 mi. roads in Page Co., to R. W. Moore & Co., Staunton, $111,768—clearing, grubbing, grading, concrete surfacing 2.422 mi. Norfolk and Nansemond Counties, to Brooks Constr. Co., Inc., Norfolk, $56,170—2 bridges over Chappawansic Creek, one on Project 879-B2, other on Project 879-B1, both Route 31, Prince William Co., to Cobb & Homewood, Chapel Hill, N. C., $6,225 and $5,074 respectively. Grand total $179,837. Rejected bids clearing, grubbing, grading, one course macadam surfacing 3.041 mi. Bedford Co., work will be done by convict labor. Noted July 3.

Wash., Seattle—Bd. P. Wks., paving 8th Ave. to F. Fiorito, 8460 West 48th St., $75,218; and Madison and East Madison Sts. to L. Coluccio, 1642 Lane St., $28,337. Noted July 31.

W. Va., Charleston—Rein.-con. paving Glen Ave. and 11 other streets, to K. E. Reed & Co., Charleston, $49,360.

W. Va., Wheeling—Ohio Co. grading, widening 3,800 ft. Waddells Run Rd., to Stringer & Springer Constr. Co., Wheeling Bank Bldg., Wheeling, $27,401. Noted July 10.

Wisconsin — State and Adams, Portage, and Waushara Counties, Wisconsin Bridge, constructing, concrete paving 10.92 mi. Wood County Line-Plainfield Rd., S.T.H. 73, F.A.P. 440-B, to Kramp Constr. Co., Berlin, $166,067. Noted July 24.

Wisconsin — State and Sheboygan Co. Hy. Comns., Court House, Sheboygan, concrete surfacing 4.02 mi. Haven-North County Line Rd. S. P. 2912, U. S. Hy. 141, to McGucken-Vander Heyden Co., 314 Fowler St., Milwaukee, $69,480.

Wyoming—State Hy. Comn., Cheyenne, grading 2.369 mi. Albany Co., to M. R. Deskin, Ft. Collins, Colo., $29,080—13.554 mi. Fremont Co., to Sharrock & Pursell, Casper, $87,702—5.725 mi. Uinta Co., to A. O. Thorne, Springville, Utah, $30,576—11.94 mi. incl. 4 timber bridges, 3 concrete culverts, Niobrara Co., to Stevens Bros., St. Paul, Minn., $48,150—surfacing 11.074 mi. Washakie Co., to Taggart Constr. Co., Cody, $21,469. Grand total

Ont., London—Middlesex Co., concrete paving 5¼ mi. Heggerty Rd. and road from Strathburn to Glencoe, to Towland Constr. Co., Guelph, $130,000.

Ont., Toronto—Bitulithic on concrete paving 1¼ mi. Falcon Ave., Blythwood Rd., Alexander and Lytton Blvds., 24 ft. and wider to Warren Bituminous Paving Co., 54 University Ave., $77,946.

Ont., Toronto—York Twp., J. Harvey, clk., 40 Jarvis St., asphalt paving 1¼ mi. Bala, Bartonville, Eglinton, Leigh and Ray Aves., to Godson Constr. Co., 203 Richmond St., W., $124,539.

Ont., Toronto—York Co., waterbound macadam paving 2 mi. Sharon-Mt. Albert Rd. 20 ft., to A. E. Jupp Constr. Co., 170 Berkeley St. Est. $40,000.

Ont., Windsor—City, paving Goyeau St. and Marentette Alley, to H. L. Bondy, 31 Bridge St., $13,274 and $3,728 respectively—Marion Ave., to G. Oldany Co., 921 Dougal Ave., $5,609—alley between Janette and Bruce Sts., to Calautte Bros., 612 Langlois Ave., $3,229—2 alleys, to Cleary-Dean-Nicli Co., c/o R. J. Desmarais, engr., City Hall, $4,169. Grand total $30,009.

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EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ind., Fowler—Benton Co., improving Jacob Lenck Ditch, incl. 6.65 mi. main ditch, 16,671 ft. laterals, $35,000. D. Heaton, Fowler, engr.

Ind., Fowler—Bd. Comrs. Benton Co., Upper Sugar Creek Ditch, $25,000. D. Heaton, Fowler, engr.

Ind., Hartford City—Bd. Comrs. Blackford Co., improving Cooper Drain, $27,000. C. C. Oberleas, Hartford City, engr.

Ind., Plymouth—Bd. Comrs. Marshall Co., W. A. Engel Ditch, $25,000. J. W. Botset, Plymouth, engr.

Ind., Rensselaer — Bd. Comrs. Jasper Co., Christian L. Fritts Ditch, $26,000. W. Parks, Rensselaer, engr.

Ind., Tipton—Bd. Comrs. Tipton Co., constructing Legg Drain, $25,000. J. O. Bowlin, Tipton, engr.

Kan., Ozawkie—Delaware River Drainage District, c/o H. A. Ploughe, preliminary plans straightening Delaware River, $25,000. Kansas Eng. Co., 601 Kansas Ave., Topeka, engrs.

Okla., Pauls Valley—Garvin Co. preliminary plans drainage ditch on Wild Horse Creek, $45,000. A. Rennie, Pauls Valley, engr.

Texas—Irrigation Dist. c/o F. S. Robertson, San Benito, preliminary plans irrigation and power project, incl. 10 impounding dams across Rio Grande River, two of which will be in Webb Co.

Tex., Berreda—Cameron Water Impvt. Dist. 17, c/o D. Porter, Brownsville, irrigating 1,900 acre tract, incl. pipe system, pumping unit, $225,000 bond election soon for same. Address District.

BIDS ASKED

Calif., Palmdale—Aug. 22, by Bd. Directors Palmdale Irrigation Dist., 1,350 g.p.m. turbine pump, motor, 900 g.p.m. horizontal booster pump, motor, 3,000 ft. or more 14 gauge 12 in. welded Toncan iron pipe with valves. H. P. Scholeer, Palmdale, dist. engr.

Calif., Turlock—A. Sorenson, secy. Turlock Irrigation Dist., bids about Sept. 2, 960,000 sq.ft. 2 in. canal lining.

Conn., Hartford — Aug. 19, by City, City Hall, 357,000 cu.yd. earth excav., 14,000 cu.yd. stone riprap, 945,000 cu.yd. dredging to be used in dike, 400,000 cu.yd. fill, 25,800 cu.yd. ditch excav., 27,400 sq.yd. concrete slope paving outer face, 150,000 cu.yd. seeding. $600,000. R. N. Clark, City Hall, engr.

La., Opelousas — Gravity Drainage Dist. in Prairie Basse, St. Landry Parish, A. Roy, secy., bids about Aug. 30 or Sept. 24, drainage work, $75,000 voted. M. J. Goudeaux, Jr., Opelousas, engr.

Okla., Purcell—Aug. 11, by P. Daugherty, clk. Walnut Creek D. D. 1, McLain Co., drainage work, incl. 1,000,000 cu.yd. dry earth excav., $178,000. J. C. Milliken, Southwest Natl. Bank Bldg., Oklahoma City, engrs.

O., Hartville—Comrs. Stark Co., Canton, bids about Sept. 24, 0.75 mi. ditch in Hartville Celery Dist. $25,000. G. L. Sickafoose, 916 7th St. N. W., engr.

British Columbia—Aug. 14, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., extending dyke, Annieville Bar. $15,000.

CONTRACTS AWARDED

Ind., Vincennes—Knox Co. Jacob Klein Ditch, to Keene Constr. Co., Sullivan, $79,428.

Ia., Boone—Boone Co., 27,614 ft. drain tile, 65 ft. sewer pipe, 13 highway gates, to Iowa Pipe & Tile Co., East 4th St. and Hays Sts., Des Moines, $13,000, and to Hurt & Wilson, Woolstock, $5,529.

Ia., Onawa—Monona Co. cleaning out main Ditch 9 and Tom King Hollow Lateral in Haitz D. D. 17, to E. F. Quackenbush, Onawa, at $0.059 per cu.yd.

La., Lake Charles—Calcasieu Gravity D. D. 3, Calcasieu Co., c/o Louisiana Western Lumber Co., cleaning out main bayou, enlarging drainage ditches, incl. 825,000 cu.yd. excav., to Lake Arthur Dredging Co., Beaumont, Tex., at $0.0795 per cu.yd. Est. $85,000. Noted July 3.

Minn., Rochester—State Hy. Comn., St. Paul, 25,600 cu.yd. channel change on State Project 59-27, Sect. 1, near here, to McLaughlin & Lange, 4531 Drew Ave. S., Minneapolis, $43,282.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, dredging in Newtown Creek to Morris & Cummings Dredging Co., 44 Whitehall St., New York, $15,068—in Wallabout Canal to W. Beard & Co., 59 Pearl St., New York, $12,900 and dredging in Gowanus Canal to Snead Bros., Inc., $9,900. Grand total $37,808. Noted July 3.

Ont., Hamilton—Dpt. P. Wks., Ottawa, dredging harbor in front of Canada Steamship Co.'s wharf, to Canadian Dredging Co., 198 King St., Midland. Est. $125,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ariz., Phoenix — FEDERAL BUILDING — Treas. Dpt. at office Sup. Archt., federal building.

Connecticut—DREDGING—U. S. Eng., Providence, R. I. 94,900 cu.yd. in Thames River.

D. C., Wash.—SEAWALL—U. S. Eng. 24,000 tons rip rap seawall along the Anacostia River.

Ga., Savannah—DREDGING—U. S. Eng. 75,000 cu.yd. in Savannah River, at Drakies Cut.

New York—DREDGING—U. S. Eng. 84,000 cu.yd. near Abbey Cut and 88,000 cu.yd. at Mills, near Albany in Hudson River.

N. Y., New York—DREDGING, etc.—U. S. Eng. First Dist., Army Bldg., Whitehall St., dredging, removing 25,700 cu.yd. material and 98,870 cu.yd. ledge rock in East River.

Tenn., Memphis—PIPE—U. S. Eng., 12,510 lin.ft. corrugated galvanized iron culvert pipe and 362 joining bands, Birds Point New Madrid Floodway.

Tex., Brownsville—POST BUILDINGS—Con. Q. M. plans remodeling buildings, heating units and mechanical equipment at Fort Brown Post, near here.

Tex., El Paso—PRISON—Dpt. Justice plans by Trost & Trost, El Paso, federal prison. Noted June 4.

Tex., Randolph Field—HANGAR APRONS—Con. Q. M. plans 120 x 250 x 5 ft. rein.-con. hangar aprons.

Va., Hampton Roads—NAVAL BUILDINGS—Yard & Docks, Navy Dpt., buildings at Naval Training Station.

BIDS ASKED

Arizona—ROAD—Aug. 12, by Park Superintendent Grand Canyon, grading, rein.-con. paving 17.57 mi. Grand Canyon-Old Trails Natl. Park Hy., in Tusayan Natl. Forest, Cocomino Co. C. H. Sweetser, dist. engr.

Ark., El Dorado—POST OFFICE, etc.—Aug. 28, by Treas. Dpt. at office Sup. Archt., post office, court house.

Ariz., Flagstaff—ENCAMPMENT—Aug. 9, by U. S. Property & Disbursing Officer, State Capitol Bldg., Phoenix, permanent encampment, incl. sewers, waterlines, electric light systems, 18 mess halls, warehouse, administration, power house, infirmary and guardhouse, at Fort Alex. M. Tuthill.

California — ROAD — Aug. 14, by C. H. Sweetser, dist. engr., U. S. Bur. P. Rds., 461 Market St., San Francisco, crushed rock and asphalt oil surfacing 12.046 mi. Quincy-Beckwith Natl. Forest Hy., Plumas Co.

California—DREDGING—Aug. 28, by U. S. Eng., California Fruit Bldg., Sacramento, dredging 779,000 cu.yd. in New York Slough.

Calif., March Field—HOSPITAL—Aug. 20, by Con. Q. M., hospital at March field.

Colorado—ROAD—Aug. 15, by A. E. Palen, dist. engr., Bur. P. Rds., Denver, grading 6.02 mi. Willow Creek Pass, Natl. Forest Hy., in Arapahoe Natl. Forest, Grand Co.

Delaware—DREDGING—Aug. 15, by U. S. Eng., Wilmington, dredging 25,100 cu.yd. material from entrance channel and shoals in Murderkill River; adv. E. N.-R. Aug. 7.

D. C., Wash.—BRONZE BARS—Aug. 12, by General Purchasing Officer, bronze bars, stay-bolt, iron, brass pipe, hand tire pumps, combined chronometer, stop watches motor-boat horns, steel snach switches, etc. Schedule 2576.

D. C., Wash.—PUMPING UNITS—Aug. 20, by A. L. Flint, Gen. Purch. Agent, Panama Canal, pumping units, transformers, compensator, valve setting machines, winches, etc. Schedule 2577.

D. C., Wash. — ROADWAY — Aug. 19, by Quartermaster Supply Office, Washington General Depot, 2½ in. bituminous on 6-in. concrete paving 2,800 ft. roadway, 30 ft. wide.

Illinois—LEVEE—Aug. 20, by U. S. Eng. Office, 428 Custom House, St. Louis, Mo., enlarging, rebuilding levee in Clear Creek Levee and Drainage Dist., Union and Alexander Counties.

Mass., Northampton—HOSPITAL—Sept. 2, by Vet. Bur., Arlington Bldg., dining hall, altering and constructing hospital addition, U. S. Veterans Hospital.

Mo., Jefferson Barracks—ROAD—Aug. 26, by U. S. Vet. Bureau, Arlington Bldg., roads at U. S. Veterans Hospital.

Mo., Sedalia—POST OFFICE—Aug. 18, by Treas. Dpt. at office Sup. Archt., post office. Noted June 5.

N. Y., Plattsburg—BARRACKS—Sept. 1, by Con. Q.M., Plattsburg Barracks, constructing hospital detachment barracks; adv. E. N.-R. Aug. 7.

Pa., Pittsburgh—GATE—Aug. 29, by U. S. Eng., furnishing, erecting 1 rolling lock gate for Lock 6, Ohio River; adv. E. N.-R. Aug. 7.

Va., Langley Field—QUARTERS—Aug. 21, by Con. Q. M., 14 non-commissioned officers quarters.

CONTRACTS AWARDED

Arizona—ROAD—C. H. Sweetser, dist. engr., San Francisco, Calif., grading, 4.927 mi. Houserock Canyon Natl. Forest Rd., Kaibab Natl. Forest Coconino Co. to Jasper-Stacy Co., 216 Pine St., San Francisco, Calif., $241,911. Noted June 19.

Ariz., Prescott—ELEVATOR—Treas. Dpt. at office Sup. Archt., installing elevator plant in Federal Bldg., to Kimball Bros., Council Bluffs, Ia., $7,152.

Ill., Chicago—BREAKWATER—U. S. Eng., rebuilding inner arm breakwater, Chicago Harbor, to Great Lakes Dredge & Dock Co., 104 South Michigan Blvd., Chicago, Ill., $129,713.

Kan., Junction City—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to J. P. Grogan, Santa Fe, N. M., $72,300. Noted June 5.

Louisiana — LEVEE — U. S. Eng. 615,000 cu.yd. Chatsworth Levee and 410,000 cu.yd. Granda Levee, to Lewis Chambers Constr. Co., Canal Bank Bldg., New Orleans, $188,641.

Md., Baltimore—POST OFFICE—Treas. Dpt. at office Super. Archt., 1 story, basement, post office, garage and repair shop to H. E. Gilbert and T. F. Mullan, Charles and Chase Sts., est. $200,000. Noted July 10.

Federal Government (Continued)

Mich., Flint—POST OFFICE—Treas. Dpt. at office Sup. Archt., brick, steel, concrete, to L. Balkin Co., 1852 West Austin Ave., Chicago, Ill., $330,715. Noted June 12.

Miss., Vicksburg—STEEL WIRE FABRIC—U. S. Eng., 35,000 squares extra galvanized steel wire fabric, to C. T. Patterson Co., Inc., 810 Tchoupt St., New Orleans, Pa., $42,525.

Missouri—BRIDGES, etc.—U. S. Eng., McCall Bldg., Memphis, Tenn., bridges, culverts, roads in connection with Bird's Point-New Madrid Floodway Drainage System, to Forcum-James Co., Dyersburg, Tenn. $129,093. Noted July 17.

Pa., Phila.—DIKES—U. S. Eng., 5,900 lin.ft. Delaware River North End-Pea Patch Island Dike, to Rendle Corp., East Boston, Mass., $233,050. Noted June 19.

O., Wright Field—LABORATORY—Con. Q. M., radio laboratory, maintenance building, to Hailbauer LaBahm, Inc., 844 Rush St., Chicago, Ill., $129,000. Noted June 26.

Tex., Randolph Field — OPERATIONS and PARACHUTE — Con. Q. M., operations and parachute building, to Sumner Sollitt Co., Natl. Bank of Commerce, Bldg., San Antonio, $75,580.

Tex., Randolph Field — QUARTERS — Con. Q.M., maintenance building, fire station, and 85 officers quarters, to Bellows-MacLay Constr. Co., Constr. Industrial Bldg., Dallas, Tex., $1,001,947. Noted June 26.

Utah—ROAD—Bureau P. Rds., Kiesel Bldg., Ogden, grading, 4.66 mi. Logan-Garden City Rd., Cache Natl. Forest, Cache Co. to O. Nelson, Logan, $96,825.

Washington—BRIDGE—Pub. Rds., Portland, Ore., bridge over Frying Pan Creek, in U. S. Forest Reserve, Pierce Co., to A. F. Berni, Portland, Ore., $54,259.

Wyoming—ROADS—Bur. P. Rds., Denver, Colo., grading, surfacing 15,063 mi. Grand Loop Park Highway, Yellowstone Natl. Park, Teton Co. to Morrison & Knudson Co., Boise, Idaho, $448,118. Noted July 17.

FEDERAL POWER COMMISSION

Applications for License and Permits Licenses

1097—J. A. Zehntbauer, 105 East 19th St., Portland, Ore., wants license power project on Jacks Creek, within Deschutes Natl. Forest, Jefferson Co.

1098 — Booth Fisheries Co., Marion Bldg., Seattle, Wash., wants license power project on Snowbird Creek, on public lands within 3rd Judicial Div., Unga Recording Dist., Alaska.

1099—A. Willcoxen, Cascade Summit, Ore., wants license power project within Deschutes Natl. Forest, Trapper Creek, Kalmath Co.

1100—Pub. Serv. Co. of Coloredo, Denver, Colo. wants license transmission line within Cochetopa Natl. Forest, Saguacho Co.

1101—Prince William Sound Water-Power, Light & Telephone Co., Valdez, Alaska, wants license power project on public lands, within Valdez Recording Dist., Solomon Gulch.

1102—East Tennessee Light & Power Co., Bristol, Tenn., wants license transmission line partly within Unaka Natl. Forest, Unicoi Co.

1103—Southern California Edison Co. Ltd., 306 West 3rd St., Los Angeles, Calif., wants license transmission line within San Bernardino Natl. Forest, in San Bernardino Co.

1104—San Diego Consolidated Gas & Electric Co., Electric Bldg., San Diego, wants license transmission line on public lands in San Diego Co.

RAILWAYS

PROPOSED WORK

Texas—St. Louis, San Francisco Ry. Co., F. G. Jonah, ch. engr., St. Louis, Mo., extending 45 mi. line between Vernon and Seymour, and 60 mi. line between Seymour and Paducah.

BIDS ASKED

Illinois—Aug. 12, by A. C. Simons, purchasing agent, 403 Grand Central Station, Harrison and Wells Sts., Chicago, 15 locomotives Type 2-10-4 with 63 in. drivers, f.o.b. Chicago for Chicago Great Western R.R.

CONTRACTS AWARDED

Virginia—Chesapeake & Ohio R.R. Co., Richmond, Va., C. W. Johns, ch. engr., 3,168 ft. single track tunnel in Allegheny Mountains, 15 mi. from Covington, to Bates-Rogers Constr. Co., 111 West Washington St., Chicago, Ill., $1,100,000.

SUBWAYS AND TUNNELS

Mich., Eloise — Comrs. Wayne Co., County Bldg., Detroit, plans rein.-con., brick causeway tunnel in connection with infirmary building, $50,000. P. W. Keating, 528 Ford Bldg., Detroit, engr.

Ont., Kitchener — City and Canadian Natl. Ry., New Union Sta., Toronto, T. T. Irving, ch. engr., widening concrete, steel subway on Park St. under Canadian Natl. Ry. $25,000 up. S. Shupe, city engr.

Ont., Oakville — Canadian Natl. Ry., New Union Sta., Toronto, T. T. Irving, ch. engr., and Halton Co., R. F. Smith, engr., concrete, steel subway under Canadian Natl. Ry., near here, $25,000-$50,000.

BIDS ASKED

California—See "Streets and Roads."

Ind., Huntington—Aug. 15, by City, subway under Erie R.R. at State Roads 9 and 24. $125,000. Address City Clerk.

CONTRACTS AWARDED

Kan., Wichita—C. C. Ellis, city clk., substructure subway under Atchison, Topeka & Santa Fe R.R. at Waterman St., incl. 7,800 cu.yd. excav., 3,300 cu.yd. backfill ,abutments, column footing complete, to List & Weatherly Constr. Co., Railway Exch. Bldg., Kansas City, Mo. $27,000. Atchison, Topeka & Santa Fe Ry. Co., 80 East Jackson Blvd., Chicago, Ill. G. W. Harris, ch. engr., will construct track falsework. Noted July 3.

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., Sect. 1-A, Route 8, West 14th St., to Del Balso Constr. Co., 352 Schermerhorn St., Brooklyn, $490,236. Noted July 17.

Va., Covington — See "Railways under Virginia."

GRADE CROSSINGS

PROPOSED WORK

Tex., Beaumont—City and Southern Pacific Lines, R. W. Barnes, ch. engr., Houston, underpasses at all crossings within city limits, eliminating grade crossings except viaduct at Mariposa St. $4,000,000. City pays $900,000, and Railway Co. $3,100,000 toward cost.

BIDS ASKED

N. Y., Syracuse—Aug. 12, by New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating grade crossing at Miller Ave. $206,000. N. F. Pitts, Jr., State Tower, engr.

CONTRACTS AWARDED

N. Y., Angola — New York, Chicago & St. Louis R.R. Co., H. M. Hockman, ch. engr., Terminal Tower, Cleveland, O., 23 x 300 ft. rein.-con. crossing over Nickel Plate tracks, to H. E. Culbertson Co., Union Trust Bldg., Cleveland, O.

DAMS

PROPOSED WORK

Tex., Dalhart—E. S. Carter, C. C. Dinwiddie & Associates, Dalhart, forming corporation and plans dam across Rita Blanca Canyon at site of Blair Dam, west of here. $45,000. Work will probably be done by day labor. Private plans.

CONTRACTS AWARDED

Calif., Ione—State Dpt. P. Wks., Sacramento, rein.-con. dam 192 ft. at crest, for Preston School of Industry, to G. French, Jr., Cherokee Lane, Stockton, $14,300.

PIERS AND WHARVES

Calif., San Francisco—State Harbor Comn., Ferry Bldg., taking bids rein.-con. pier shed with steel columns. Pier 1, for State. $90,000. F. G. White, Ferry Bldg., engr.

N. J., Camden—Aug. 25, by Southern Jersey Port Comn., 106 Market St., steel bulkhead shed and appurtenances at Marine Terminal, on Delaware River, between Clinton and Pine Sts. U. S. Jeffreys, secy.; adv. E. N.-R. Aug. 7.

CONTRACTS AWARDED

La., New Orleans—WHARF—Bd. Comrs. Port of New Orleans, concrete foundation on timber piling for Mandeville St. Wharf, to T. Carey, New Orleans, $59,688.

La., New Orleans—WHARF—Bd. Comrs. Port of New Orleans, New Orleans Court Bldg., concrete foundation on timber piles for Bienville St. Wharf, to Dalgarn Constr. Co., New Orleans, $125,953.

AIRPORTS

PROPOSED WORK

Massachusetts—Massachusetts Air Terminal & Arena, H. E. Shaw, trustee, Norwood, grading, surfacing airport in Norwood, Dedham and Canton. $1,000,000. Merick & Wildish, 1525 East 53rd St., Chicago, Ill., engrs. C. Kenniston, engr., Verne Inn, Norwood, soon takes bids drainage, surfacing for above.

CONTRACTS AWARDED

Ia., Baton Rouge—East Baton Rouge Police Jury Parish, administration building, hangar, to A. C. Stewart, Baton Rouge, $50,602; plumbing and heating, to State Plumbing & Heating Co., Baton Rouge, $2,156; electrical work to Baton Rouge Electric & Machine Co., Baton Rouge, $3,600. Grand total $56,358. Noted July 10.

La., Shreveport—City, C. S. Wolf, secy. and treas., administration building and hangar, to W. M. Werner, Shreveport, $57,900; concrete and paving, to E. Cochran, Shreveport, $2,318. Noted June 12.

Minn., Duluth — City, general contract administration building and hangar, at Williamson-Johnson Municipal Airport, to A. Hedenberg & Co., 203 Lyceum Bldg., $35,864.

Mo., Bridgeton—Bd. P. Serv., St. Louis, additional runway at St. Louis Municipal Flying Field, to Bridges Asphalt Paving Co., 1411 Central Industrial St., St. Louis, $65,595; drains for runway and taxi strips, to Martin & Reilly, 7227 Lindell Blvd., $29,319.

GRAIN ELEVATORS

CONTRACTS AWARDED

Ia., Council Bluffs—GRAIN ELEVATOR—Chicago, Burlington & Quincy R.R. Co., 547 West Jackson Blvd., Chicago, Ill., A. W. Newton, ch. engr., 200,000 bu. rein.-con. addition to grain elevator, 4th St. and 28th Ave., to Burrell Eng. & Constr. Co., 513 West Jackson Blvd., Chicago, Ill. Est. $125,000.

Ia., Sioux City—GRAIN ELEVATOR—International Milling Co., 1100 Flour Exch. Bldg., Minneapolis, Minn., 8 concrete storage bins, 4 in a row in pairs, each 18 ft. diam., 110 ft. high, on wood pile and concrete slab mattress, Leeds (suburb), to Burrell Constr. Co., 1 North Canal St., Chicago, Ill., $50,000.

Kan., Salina — GRAIN ELEVATOR — Salina Terminal Elevator Co., c/o J. J. Vanier, 500,000 bu. rein.-con. addition to grain elevator, to Chalmers & Borton, 620 Pioneer Trust Bldg., Kansas City.

Mont., Great Falls—GRAIN ELEVATOR—Montana Flour Co., general contract 12 concrete bins, each 28 ft. diam., 100 ft. high, to Alloway & George, Hutton Bldg., Spokane, Wash. Est. $75,000.

POWER AND LIGHTING

PROPOSED WORK

Tex., Dallas—Dallas Power & Light Co., Interurban Bldg., expending $1,258,247 in next two years, improving, extending power transmission lines, incl. completing 60,000 volt transmission line circling greater Dallas.

BIDS ASKED

Calif., San Diego—See "Streets and Roads."

Ind., Indianapolis—Aug. 11, by Bd. Health H. S. Leonard, pres., City Hall, electrical fixtures for new laundry building, alterations and additions to electric light, power and signal systems in certain buildings, new motor generator sets, motor and control equipment at city hospital.

CONTRACTS AWARDED

Mich., Detroit—Public Lighting Comn., East Atwater St., street lighting system, incl. underground conduit, in Rosedale Park, Dexter Blvd., Grandmont, Sherwood, Forest Sts., Davison, Woodrow Wilson, Webb and West Warren Aves., to Collier Constr. Co., 721 Free Press Bldg., $168,911.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, electrical work for Central Court Building to W. H. Taverner Corp., Madison Ave. and 57th St., New York, $114,500.

Texas—Thurman Barrett Co., 429 North St. Marys St., San Antonio, (8th unit) 1.5 mi. electric lnies, Mayfield Park Sub-Division, to San Antonio Pub. Serv. Co., North St. Marys St., San Antonio.

SPORTS AND PARKS

PROPOSED WORK

Calif., Sacramento—Sacramento Ice Hockey Club by Starks & Flanders, Forum Bldg., sports arena, incl. facilities for ice hockey, boxing, wrestling, large natatorium, one 60 x 180 ft. and one 40 x 60 ft. pools, L St. and Alhamora Blvd. $250,000 or more.

Conn., New Britain — City, City Hall, new parkway, incl. center park strip, landscape gardening, two 28 ft. roadways, two 10 ft. sidewalks, between Hillcrest Ave. and Hartford Rd. To exceed $25,000.

Conn., Wallingford—Choate School, G. C. St. John, headmaster, raising $225,000 funds, gymnasium. Engineer not selected.

Mass., Boston—Commonwealth of Massachusetts, Metropolitan Dist. Comn., sketches beach and park along Charles River Embankment; also improving basin. $2,000,000.

N. J., Elizabeth—Bd. Educ., 417 South Broad St., central athletic field, at rear Thomas Jefferson High School. $25,000.

N. J., Elizabeth—Recreation Comrs., City Hall, brick natatorium. $50,000. Architect not selected.

N. J., Jersey City—Bd. City Comrs., City Hall, municipal stadium. $100,000 or more. Engineer not selected.

O., Cleveland—City, D. E. Morgan, mgr., 1 story, brick, steel, terra cotta, stone recreation center, incl. swimming pools, East 46th St. and Outhwaite St. $250,000. H. Kregelius, 504 City Hall, archt.

Pa., Warren—Plans by Lawrie & Green, 821 North 3rd St., Harrisburg, athletic field, incl. grading, drainage, metal fencing, permanent and temporary bleachers, field houses, ticket booth, on campus new school. $50,000.

BIDS ASKED

Calif., Tracy—See "Contracts Awarded."

Mass., Norwood—Town, C. A. Bingham, mgr., taking bids reconstructing playground, tennis courts. $25,000.

Mass., Tisbury — Town Playground Com., Town Hall, taking bids constructing Owen Playground, incl. grading, 3 tennis courts. $25,000.

N. J., Nutley—M. A. Wolf, archt., 845 Broad St., Newark, bids about Aug. 15, general contract amusement park, incl. grading, landscaping, 2 swimming pools, bath houses stores, etc. for Harrison Park Impvt. Co., 24 Branford Pl., Newark. Noted July 31.

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Sports and Parks (Continued)

N. Y., Long Island City—Aug. 12, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, reconstructing and resorting golf links in Forest Park.

CONTRACTS AWARDED

Calif., Tracy—C. E. Whitman, Byron, 42 x 120 ft. concrete swimming pool, 3 to 14 ft. deep, day labor.

Mass., Gloucester—C. Birdseye, Bass Rocks, concrete swimming pool, Bass Rocks, to Mitchell & Sutherland, 250 Stuart St., Boston.

Pa., Slippery—Slippery Rock State Teachers College, general contract swimming pool, 2 story, basement, irregular shaped, concrete, steel gymnasium, to A. Wishart & Son, 172 Silver St., $106,307.

HEATING AND VENTILATING

PROPOSED WORK

N. Y., Amenia—Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, received no bids July 30, heating at Wassaic School. Noted July 17.

BIDS ASKED

N. Y., New York—Aug. 18, by Bd. Higher Educ., at office Secretary of Hunter College, Park Ave and 68th St., heating, ventilating, plumbing electrical wiring, for Unit 2, Hunter College, Bedford Park Blvd., Strong St., Goulden and Jerome Aves.

CONTRACTS AWARDED

Conn., Plainville—Town, c/o L. Staple, 74 East St., central heating plant, incl. appurtenances, to J. G. Simpson, Webster St. Est. $25,000.

Conn., Waterbury—William & Brown, Inc., 19 South Main St., heating and ventilating in business block (stores and offices). East Main and South Main Sts., to R. A. LaCentra & Co., 57 Washington St. N., Boston, Mass. Est. exceeds $25,000.

Mass., Fall River—Comrs. Bristol Co., c/o R. E. Warner, heating, ventilating, plumbing in Registry of Deeds Building, North Main St., to W. E. Sullivan, 972 South Main St. Est. exceeds $25,000.

Ont., Guelph — Dpt. P. Wks., Parliament Bldgs., Toronto, steam heating, mains and pumping equipment at Ontario Agricultural College, to Sheppard & Abbott, 119 Harbord St., Toronto, $35,000. Noted Oct. 31 under "Schools."

UNCLASSIFIED

PROPOSED WORK

Ill., Belleville—COAL MINE TIPPLE, etc.—Perry Coal Co., c/o C. J. Sandoe, vice pres., South 76th St. near Main St., soon lets contract rebuilding concrete, steel tipple and other buildings, recently destroyed by fire. $175,000.

Mass., Lexington — GREENHOUSE and POWER HOUSE — See "Contracts Awarded."

N. Y., Crown Point—GRANITE WORK—Commissioner Conservation, State Office Bldg., Albany, rejected bids Aug. 1, for completing granite work, Champlain Memorial Lighthouse. Will readvertise. Noted Aug. 7.

O., Cleveland—CHIMNEY—Industrial Rayon Corp., H. S. Rivitz, pres., West 98th St. and Walworth Ave., 50 x 50 ft. radial brick chimney, 300 ft. high, rein.-con. found., 19 ft. deep, West 98th St. and Walworth Ave. $200,000. Christian, Schwarzberg & Gaede, Union Bldg., archts. and engrs.

Oklahoma—GAS PIPE LINE—Freeborn & Lambert, Tulsa, natural gas pipe line from Hartshorn to Blocker, distribution system in Hartshorn. $50,000. Private plans.

Oklahoma and Kansas—GAS PIPE LINE—Cities Service Gas Co., Bartlesville, 32 mi. 20 in. steel natural gas pipe line from Blackwell, Okla., to point near Wichita, Kan., $100,000. Private plans.

Okla., Blackwell — GAS STATION — Cities Service Gas Co., Bartlesville, 5,000 hp. natural gas compressor station on gas pipe line, near here. $60,000. Private plans.

Okla., Mooreland — GAS STATION — Cities Service Gas Co., Bartlesville 1,000 h p. natural gas compressor station on gas line. $75,000. Private plans.

Okla., Tuttle — GAS SYSTEM — City, preliminary plans natural gas system and supply line from city to the field. $30,000. J. W. Reinger, mayor. Engineer not selected.

Texas and New Mexico—PIPE LINE— Magnolia Pipe Line Co., Texas City and Houston, preliminary plans 8 in. pipe line between Wink, Tex. and Hobbs, N. M. $150,000. Private plans.

Tex., Richland Springs—RESORT—Richland Springs Tavern resort, incl. 100,000 gal. rein.-con. reservoir, pump, 30,000 watt light plant. Private plans.

Wyo., Yellowstone Natl. Park—CABINS—Yellowstone Natl. Park Camps Co., Mammoth Hot Springs, W. H. Moorman, mgr., sketches 200 cabins in park.

BIDS ASKED

Mass., Brookline (br. Boston)—LOCKER BUILDING—Aug. 11, by Northern University, J. Stevenson, 316 Huntington Ave., Boston, 1 story, brick, concrete locker building, $50,000. Ripley & LeBoutillier, 45 Bromfield St., Boston, archts.

N. Y., Brooklyn—FIRE ALARM SYSTEM—Aug. 15, by J. J. Dorman, fire comr., Municipal Bldg., New York, construction portion underground fire alarm system, completing feeder "H", to Bushwick-Ridgewood Sect.

Pa., Phila.—SIDEWALK ELEVATOR—Aug. 13, by Dpt. City Transit, City Hall Annex, sidewalk elevator, underground pedestrian concourse, Broad Street Subway. Contr. 25x.

CONTRACTS AWARDED

Ia., Lewis—TELEPHONE REPEATER STATION—American Telephone & Telegraph Co., G. G. Jones, div. plant supt., 206 West Washington St., Chicago, Ill., 1 story, basement, rein.-con., brick, to Parsons Constr. Co., 219 Grain Exch. Bldg., Omaha, Neb.; heating, plumbing, ventilating, to Schollman Bros., 4114 North 24th St., Omaha, Neb.; electric wiring, to Bennett Electric Co., 106 South 18th St., Omaha, Neb. Est. $120,000.

Ind., Princeton—COAL PLANT—Deep Vein Coal Co., steel frame tipple King Station Mine, owner builds. $150,000. Private plans.

Mass., Lexington — GREENHOUSE and POWER HOUSE — E. J. Baskin, East St., 50 x 300 ft. concrete, glass greenhouse; brick, concrete power house, separate contracts. $25,000.

Mass., New Bedford—OIL STORAGE—Hathaway Oil Corp., 11 North 6th St., oil storage, concrete steel girders, brick piers, to J. W. Bishop Co., 6 Market St. Est. $25,000.

Okla., Tulsa—TRAIN SHEDS—St. Louis, San Francisco Ry. Co., Frisco Bldg., St. Louis, Mo., F. G. Jonah, ch. engr., concrete driveways and platforms to Reid & Lowe, P. O. Box 990, Birmingham, Ala.; three 600 ft. rein.-con. structural steel and composition roof train sheds, 8 ft. wide, to Manhattan Constr. Co., Court Arcade Bldg., Tulsa.

Tex., Luling — PUMPING RIG and EQUIPMENT—Deake Oil Co., 1111 Alamo Bank Bldg., San Antonio, pumping rig and equipment, near here, to Continental Supply Co., Luling, $35,000.

Texas — NATURAL GAS LINE — Thurman Barrett Co., 429 North St. Marys St., San Antonio, (8th unit) 1.5 mi. 6 in. natural gas mains in Mayfield Park Sub-Division, to San Antonio Pub. Serv. Co., North St. Marys St., San Antonio, $20,000 (mostly for pipe).

Texas and Illinois—NATURAL GAS PIPE LINE—Insull Son & Co., Inc., 111 Bway., New York, and 20 North Wacker Dr., Chicago, Ill., Henry L. Doherty & Co., and Cities Service Co., 60 Wall St., New York, awarded contract Sect. 3, part of natural gas pipe line from Amarillo, Tex., to point near Chicago, Ill., through Ford, Bacon & Davis, Inc., 39 Bway., New York, to Smith Bros., Santa Fe Bldg., Dallas, Tex., Sheehan Bros., Tulsa, Okla., and Bechtel & Kaiser, San Francisco, Calif. Total $40,000,000. Noted June 19.

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MATERIALS

BIDS ASKED

BRIDGE MATERIAL—**Fairfield, Ia.**—Aug. 12, at office Auditor, Jefferson Co., 143,100 mbm. rough fir bridge plank, 5,667 mbm. rough pressure treated, 4,000 lin.ft. pressure treated bridge piling.

OIL—**Trenton, N. J.**—Aug. 12, by Dpt. Institutions & Agencies, State Bldg., 21,000 gal. oil—1,000 tons 1½ in. stone; 300 tons ¾ in. stone—and 150 tons screenings for entrance road at New Jersey State Hospital, Hillsdale. C. N. Leathem, State Bldg., engr.

CONTRACTS AWARDED

ASPHALT CEMENT—**Brooklyn, N. Y.**—H. Hesterberg, pres., Brooklyn Boro, Boro Hall, 400,000 gal. asphalt cement to Warner Quinlan Co., 79 Wall St., New York, $23,920—15,000 cu.yd. sand to M. F. Hickey, foot 6th St., $13,350 and 15,000 cu.yd. binder stone to New York Trap Rock Corp., 101 Park Ave., New York, $28,950. Grand total $66,220. Noted July 3.

EQUIPMENT

BIDS ASKED

POWER PLANT EQUIPMENT — **Oakland, Calif.**— Aug. 13, by J. H. Kimball, secy. East Bay Municipal Utility Dist., 512 16th St., furnishing, delivering spare parts for Pardee Power Plant. $8,500.

ASH HANDLING EQUIPMENT—**Chicago, Ill.**—Aug. 13, by Comr. P. Wks., ash handling equipment for Goose Island Incinerator, 1146 North Branch St.

BOILERS—**Skillman, N. J.**—Dpt. Institutions & Agencies, State Office Bldg., Trenton, new bids about Aug. 15, furnishing, installing boiler, stokers, coal and ash handling equipment, conduits, steam lines, and smoke stack. $25,000. C. N. Leathem, Trenton, engr. Noted July 31.

PLATE STEEL EQUIPMENT — **Hamilton, Ont.** — Dominion Fdrys. & Steel Ltd., C. W. Sherman, genl. mgr., special equipment manufacturing plate steel. $250,000.

Buildings

RESIDENTIAL

BIDS ASKED

Mass., Brookline (br. Boston)—See "Contracts Awarded."

N. J., Jersey City—See "Contracts Awarded."

N. J., Jersey City—Aug. 15, by F. G. Hasselman & Co. & A. J. Zerman, 34 Prospect St., East Orange, 12 story, basement, 100 x 105 ft., brick, steel, plain found., Hudson Blvd. and Gifford Ave., for Gifford Realty Co., c/o architect. Noted July 24.

N. J., Newark—J. B. Acoccella, archt., 9 Clinton St., bids about Sept. 15, general contract 2 story, basement, 100 x 150 ft., brick, steel, incl. stores, garage, plain found., for owner, c/o architect. Noted July 3.

Pa., Pittsburgh—See "Contracts Awarded."

Tex., Beeville—J. J. McKinney, bids after Aug. 12, hotel. $250,000. M. G. Simons, c/o Builders Exch. Bldg., San Antonio, archt.

Ont., Forest Hill—J. A. Thatcher, archt., 37 Cowan Ave., Toronto, bids about Aug. 15, 4 story, basement, concrete, brick, steel, for A. A. Barthelmes, 16 High Park Blvd., Toronto. $160,000. Steam heating, electric wiring, ranges and refrigeration.

Calif., Oakland — T. D. Fisher, 2851 23rd Ave., 8 story, basement, brick, steel, Walker Ave., day labor and segregated contracts. $150,000.

Calif., Oceanside — Bernard Nessa Estate, 4 story, 100 x 220 ft., rein.-con., stucco, stone, marble, tile, Oceanside St., to Pozzo Constr. Co., 421 Macy St., Los Angeles, $300,000.

Calif., Redlands—A. Gregory, 2 story, rein.-con. hotel, to F. J. Solt, San Bernardino, $165,000.

Calif., San Francisco—Suncal Investment Co., c/o A. H. Larson Co., archts., 447 Sutter St., 6 story, basement, concrete, Buena Vista Ave. and Waller Sts., day labor and segregated contracts. $175,000.

Mass., Brookline (br. Boston)—Hurwitz & Goldberg, 294 Washington St., Boston, 7 story, basement, 100 x 105 ft., brick, stone, steel, concrete found., 1438-40 Beacon St., separate contracts. $700,000. Owner soon takes sub-bids. S. E. Moffie, 43 Tremont St., Boston, archt.

Mo., Maryville—Owner, c/o L. Abt, archt., Riegel Bldg., Moberly, 5 story, basement, 66 x 111 ft., brick, steel, rein.-con. hotel, to Peterson Constr. Co., Pioneer Trust Bldg., Kansas City. Est. $160,000.

N. J., Jersey City—J. Baroff, 82 West 24th St., Bayonne, 4 story, basement, 60 x 115 ft., brick, steel, 225-29 Union St., separate contracts. $150,000. M. Kraut, 3010 Hudson Blvd., archt.

N. Y., New York—Syndicate, 18 story, 1st Ave. and 72nd St., to H. R. H. Constr. Corp., 9 East 40th St. Est. $650,000.

Pa., Pittsburgh—H. Kamin (builder), 5862 Forbes St., five 3 story, basement, 53 x 66 ft., brick, separate contracts. Est. $150,000. H. C. Hodgkins, Jones Law Bldg., archt. Noted May 15.

Ont., Toronto—D. E. Bennett, 302 Bay St., 4 story, basement, brick, steel, stone, Lonsdale Ave. and Spadina Rd. $150,000. Work will probably be done by day labor. Electric wiring, refrigeration and stoves.

CLUBS

PROPOSED WORK

Tex., Fort Worth—Masonic Order, c/o W. S. Cook, Fort Worth Natl. Bank Bldg., plans by W. G. Clarkson, 610 1st Natl. Bank Bldg., 4 story, basement, 120 x 167 ft., brick, stone masonic temple, Henderson and North Sts. $1,000,000. Noted Jan. 23.

BIDS ASKED

Calif., Long Beach — Long Beach B.P.O.E. Lodge 888 taking bids 3 story (ultimately 6 story) basement, 80 x 150 ft., rein.-con., steel, stone, 888 Cedar Ave. $400,000. W. H. Austin, Pacific Southwest Bldg., archt.

N. J., Red Bank—N. Hulme, archt., 1524 Chestnut St., Phila., Pa., bids about Aug. 15, general contract 2 story, basement, brick, steel, for First Methodist Church of Red Bank, F. A. DeMaris, rector. Noted July 10.

CONTRACTS AWARDED

Calif., Santa Ana — Com. Masonic Temple Assn., 4 story, basement, 90 x 120 ft., brick, steel, to S. N. Benjamin, 718 East 16th St., Los Angeles, $165,000. Noted June 26.

Ind., Hammond—Woodmar Golf Club, general contract 65 x 180 ft., brick, steel golf club house, to H. B. Olney, 1200 East Chicago Ave., East Chicago. Est. $150,000.

Ind., Warsaw—Eagles Lodge, general contract 3 story, basement, brick, steel lodge, to M. P. Hodges, Warsaw. Est. $150,000.

Tex., Dallas—Y.M.C.A., c/o A. Scott, general contract 1 story, basement, irregular sized, brick, stone, rein.-con. club building, 10th and Beckley Sts., to A. J. Rife Constr. Co., 1913 North Harwood St. $150,000.

HOSPITALS

BIDS ASKED

Mass., Boston—New England Medical Center, H. A. Cousens, pres. Tufts College, bids about Aug. 15, 5 story, basement, 50 x 150 ft., brick, steel nurses home, laboratory, plain found., Bennet and Ash Sts. To exceed $150,000. Andrew, Jones, Biscoe & Whitmore, 50 Congress St., archts. Noted June 19.

Mass., Dartmouth — Aug. 8, by Sol-E-Mar Hospital Corp., A. Jones, chn, building com., and W. Tallman, archt., 222 Union St., New Bedford, altering and constructing 2 story, basement, brick, stone, addition, plain found, Dartmouth St. $150,000. Noted July 31.

N. Y., Kings Park—Aug. 20, by Dpt. Mental Hygiene, State Office Bldg., Albany, reception building, employees building, altering and constructing addition to Building 2, Kings Park State Hospital.

O., Amherst—Aug. 22, by Lorain Co. Building Comn., M. H. Welty, aud., Court House, Elyria, 2 and 3 story, 50 x 320 ft., brick, stone, steel, concrete tuberculosis sanitarium, $425,000. F. W. Bail, Hanna Bldg., Cleveland, archt.

Ont., London—Aug. 14, by Watt & Blackwell, archts., 288 Dundas St., 4 story, 50x350 ft., 50x50 ft., brick hospital addition, Grosvenor St., for St. Joseph Hospital. $350,000. Noted May 29.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. Supervs. Los Angeles Co., 2 story, 188 x 191 ft., rein.-con. hospital, to Sarver & Zoss, 727 West 7th St., $210,434. Noted Dec. 12.

Ind., Crown Point—Comrs. Lake Co. general contract 3 story, basement, 36x120 ft., rein.-con., brick, incl. nurses home, to J. A. Anderson, 515 Broadway, Gary. Est. $150,000.

Mass., Cambridge—Harvard University, general contract 3 story, basement, brick, stone, steel physical laboratory on college grounds, to Turner Constr. Co., 178 Tremont St., Boston; heating and ventilating, to Cleghorn Co., 86 Broad St., Boston; electrical work, to Hixon Electric Co., 22 Elkins St., Boston; plumbing, to J. S. Cassedy, 133 Austin St. Total est. $575,000.

N. Y., Geneva—Bd. Trustees Geneva Hospital, general contract Geneva General Hospital, to Bentz Eng. Co., Salamanca, $200,000. This corrects report in June 26 issue.

Okla., Vinita — State Bd. Affairs, Capitol Bldg., Oklahoma City, 2 story, basement, 83 x 83 x 184 ft., rein.-con., brick ward building, plain found., on campus, to H. C. Buchanan, Ft. Smith, Ark., $132,555. Noted July 17.

Ont., Woodstock—Dpt. P. Wks., Ottawa, general contract brick, steel, stone, concrete addition to Ontario Hospital and power house, to Schultz Constr. Co., 45 Albion St., Brantford; structural steel, to London Structural Steel Co., London; reinforcing, to Steel Co. of Canada, Harvey Lane, Hamilton; millwork, to J. R. Eaton & Sons, Orillia; cut stone, to Niagara Cut Stone Co., Buttery St., Niagara Falls; excavation, to B. Downing, Beachville. Est. $350,000.

CHURCHES

BIDS ASKED

N. J., Arlington—Myers & Shanley, archts., 24 Walnut St., Newark, bids about Sept. 15, general contract 2 story, basement, brick, steel seminary, for Immaculate Conception Seminary, c/o architect. Noted July 31.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., bids about Sept. 2, altering and constructing 2 story, basement, brick, steel addition, plain found., Grove St. $170,000. Schmieder, Kleeman & Werther, 1007 Broad St., Newark, archts. Noted July 24.

N. J., Mendham—Aug. 12, by R. J. Reilly, archt., 12 East 41st St., New York, 4 story, basement main building, and 1 story, basement, 58 x 155 ft. chapel, for Sisters of Christian Charity, $150,000 or more. Noted July 3.

N. J., Red Bank—J. C. and G. A. Delatush, archt., 9 Broad St., bids about Aug. 15, general contract 2 story, basement, brick, steel, plain found., Riverfront, for Monmouth Boat Club, A. M. Minton, pres., $150,000. Noted July 10.

CONTRACTS AWARDED

Mass., Dorchester (sta. Boston)—Congregation Mishkan Israel, c/o M. E. Levy, archt., 43 Tremont St., Boston, 1 story, basement, brick, stone, steel synagogue, 137 Dakota St., to N. Weiner, 41 Bloomfield St. Est. $150,000.

Mass., Framingham — St. Bridgets Roman Catholic Parish, M. J. O'Connor, pastor, 830 Worcester Rd., 1 story, basement, brick, stone, plain found., Wheeler Ave. and Worcester Rd., to J. J. Prindiville Co., Prindiville Bldg. Est. $150,000. Noted May 8.

N. J., Elmora—N. J. Convery, archt., 32 Walnut St., Newark, general contract 2 story, basement, 60 x 128 ft., brick, steel, rein.-con., incl. school, to T. Reynold's Sons, Irvington, for St. Genevieve Roman Catholic Church, 739 Livingston St. Est. $300,000. Noted June 4.

Pa., Altoona — Cathedral of Blessed Sacrament, J. J. McCort, bishop Altoona Diocese, 2 story, basement, 44 x 79 ft., Indiana limestone, granite, steel rectory, 14th St. and 15th Ave., separate contracts. $150,000. G. I. Lovett, 220 South 16th St., Phila., archt. D. G. Puderbaugh, Hutchison Bldg., superv. archt.

R. I., Manville—St. Jomes Roman Catholic Church, F. Desmaris, pastor, 1 story, basement, brick, steel, stone, concrete found., to Butler & Perry, 7 Pleasant St., Pawtucket. Est. $150,000. Noted July 24.

SCHOOLS

BIDS ASKED

Calif., Belmont — J. J. Donovan, archt., Tapscott Bldg., Oakland, taking bids 2 story, rein.-con. dormitory, for College of Notre Dame. $150,000.

Calif., San Jose—Aug. 19, by State Dpt. P. Wks., Div. Architecture, Sacramento, 1 story men's gymnasium, rein.-con., 38,500 sq.ft. floor space, for State (State Teachers College).

Del., Greenwood—Delaware School Found., A. J. Taylor, vice-pres., Du Pont Bldg., Wilmington, bids about Sept. 2, 3 story, basement, brick, steel, plain found. $150,000. Guilbert & Betelle, 20 Branford St., Newark, N. J., archts.

Ind., Indianapolis—School Comrs., bids about Aug. 9, School 69, 2 story, basement, rein.-con., brick, 35th and Keystone Sts. $150,000. Harrison & Turnock, 500 Bd. Trade Bldg., archts.

Ind., Mentone—Aug. 20, by School Comrs., rein.-con., brick high school, Harrison Twp. $150,000. Henkel & Hanson, Connersville, archts.

La., New Orleans — New Orleans Parish School Bd., bids about Aug. 20, 3 story, rein.-con., brick, high school, incl. 4 laboratories, cafeteria, locker rooms, library, auditorium, Claiborne Ave. between Nashville Ave. and St. Joseph St. $500,000. E. A. Christy, c/o owner, superv. archt.

Mass., Waverley — Aug. 8, by Dpt. Mental Diseases, State House, Boston, 2 story, basement, brick kitchen and dining building plain found., at Fernald State School. $150,000. C. P. Hoyt, 8 Beacon St., Boston, archt.

Mass., Westfield—Aug. 11, by City Finance Com., City Hall, and M. W. Malonet, archt., 23 Pearl St., Springfield, Boys Trade School, 3 story, basement, 75 x 180 ft., brick, stone, plain found., Bartlett St. $175,000. Former bids rejected. Noted Mar. 27.

Mich., Escanaba — Aug. 15, by Bd. Educ., high school. $450,000. H. N. Turner, 919 Michigan Trust Bldg., Grand Rapids, archt. Noted Apr. 17.

Mich., Roscommon — Aug. 15, by C. H. DeWeale, secy. Bd. Educ., Court House, 2 story, basement, 98 x 114 ft., brick, steel, stone, concrete consolidated school, Gerrish Higgins Twp. $150,000. R. V. Gay, St. Johns, archt.

N. H., Berlin—Aug. 12, by City, W. R. Brown, chn. com., and Wells & Hudson, archts., Hanover, altering and constructing 3 and 1 story, basement, brick high school addition, incl. gymnasium, plain found. $150,000. A. S. Kellogg, 585 Boylston St., Boston, Mass., engrs. Noted July 3.

N. J., Bayonne—F. F. Durang, archt., 424 Madison Ave., New York, bids about Sept. 15, general contract 2 story, basement, 100 x 200 ft., brick, steel high school, West 13th St. and Ave. C, for St. Marys Church, W. Lawlor, dir. Educ., 326 Avenue C. $300,000. Noted July 31.

N. J., Englishtown—Aug. 12, by Bd. Educ., 2 story, basement, brick, steel, plain found., Pine and Harrison Sts. $150,000. J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, archt. Noted July 17.

N. J., Fort Lee—Bd. Educ., J. F. Whitteaker, pres. High School, bids about Sept. 2, 2 story addition to School 4, Palisade Ave. $150,000. Hacker & Hacker, 201 Main St., archts. Noted June 27.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., bids about Sept. 15, general contract altering and 2 story, basement, brick, steel, addition, Grove St. $170,000. Schneider, Kleeman & Werther, 1007 Broad St., Newark, archts. Noted July 24.

N. J., Keansburg—V. J. Eck, archt., 12 Broad St., Red Bank, bids about Aug. 15, general contract 2 story, basement, brick, steel, plain found., Carr Ave. for St. Anne's Church. $150,000. Noted July 17.

N. J., Leonardo—Bd. Educ., Middletown Twp., W. Petingale, secy., bids about Aug. 15, general contract Leonardo School, 2 story, basement, brick, steel, $180,000. E. A. Arend, Kinmouth Bldg., Asbury Park, archt. Noted June 26.

N. J., Orange—Aug. 13, by Bd. Educ., High School Bldg., Central Ave., 2 story, basement, brick, steel, plain found., Heywood Ave. $200,000. E. Sibley & L. C. Licht, 1034 Edgewood Lane, Palisade, archts.

N. J., Orange—Bd. Educ., Central Ave., bids about Aug. 15, general contract 2 story, basement, 160 x 195 ft., brick, steel, Heywood Ave. $200,000. E. Sibley, 1034 Edgewood Lane, Palisade, archt. Noted July 24.

N. J., Rutherford—Bd. Educ., High School, bids about Sept. 2, 2 story, basement, brick, steel, rein.-con. addition, plain found., Wood St. $150,000. E. I. Williams, 131 Passaic Ave., archt. Noted July 24.

N. Y., Arrochar—DePace & Juster, archts., 151 West 46th St., New York, taking bids general contract 2 story, basement, 50 x 120 ft., brick, steel, school and dormitory, for Sisters of St. John Baptist, Cleveland Pl., St. George, $150,000. Noted July 24.

N. Y., College Point — Aug. 11, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn general contract addition P. S. 29, 23rd Ave., 125th to 126th Sts., for Bd., Educ., 500 Park Ave., New York.

O., Bowling Green—Aug. 13, by Bd. Trustees Bowling Green State College, c/o A. T. Connar, 3 story, basement, brick, concrete, stone recitation building $300,000. S. P. Stewart & Son, Bowling Green, archts.

CONTRACTS AWARDED

Conn., New Milford—J. Pettibone, supt. School Comn., Town Hall, 2 story, basement, 65 x 145 ft., brick, steel high school, incl. manual training department, to H. H. Taylor & Son, Railroad St. Est. $150,000. Noted July 3.

Conn., Stamford—City, c/o A. H. Emery, Jr., Glenbrook, 2 story, basement, 60 x 211 ft., brick, steel, concrete school, to Vuono Constr. Co., 303 Main St. Est. $300,000. Noted July 17.

Ill., Chicago—Catholic Bishops of Chicago, 719 Cass St., masonry contract 3 story, 666 x 184 ft., brick, 9827-35 Throop St., to Van Etten Bros., 11016 South Michigan Ave. Est. $235,000.

Ind., Indianapolis—Bd. School Comrs., general contract Grade School 49, 2 story, basement, rein.-con., brick, to J. G. Karstedt Constr. Co., 632 Architects Bldg. Est. $150,000.

Ind., Lafayette—Bd. Trustees Purdue University, general contract Thos. Duncan Memorial Building, 3 story, basement, rein.-con., brick, and Franklin L. Cary Hall, brick, steel, to A. E. Kemmer, 3rd and Brown Sts. Ests. $160,000 and $150,000 respectively. Noted July 24.

Mich., Grand Rapids — H. Morrel, mgr. Bd. Educ., 3 story, basement, 70 x 177 ft., brick, rein.-con. addition to Ottawa Hills High School, Iroquois Dr., to Lindh-Gustafson-Klopfer Co., 128 Crescent St. N. W., $165,117. Noted July 10.

Ia., Ft. Dodge—Bd. Educ., E. E. Peterson, secy., excavation contract Junior High School, 2 story, basement, rein.-con., brick, stone, 9th St. and 4th Ave., to S. R. Quealy, Ft. Dodge. Est. $200,000.

Me., York—E. A. Small, supt. schools, altering and constructing 3 story, basement, brick, steel high school addition, plain found., to C. W. Cunningham & Son, 181 State St., Portland. Est. $150,000. Noted July 17.

Md., Baltimore—Bd. Awards, 2 story, basement, irregular sized, brick, concrete school addition, to Lacchi Constr. Co., Munsey Bldg., for Mayor and City Council, City Hall, $199,877. Noted July 17.

Md., Baltimore—Bd. Awards, 2 story, basement, brick, hollow tile, steel, stone school Gardenville Sect., Blair Rd. and Franklin Ave., to Henry L. Maas & Son, 1119 Ensor St., $193,000.

Mass., Marlboro—A. A. Mertel, chn. School Comn., and M. A. Dyer Co., archts., 1 Beacon St., Boston, 2 story, basement, 60 x 140 ft., brick grade school, plain found., Bigelow St., Ward Park, to T. P. Hurley Constr. Co., 196 Main St. Est. $150,000. Noted July 10.

Mass., West Springfield (br. Springfield) — Immaculate Conception Church, J. O'Connell, pastor, 2 story, basement, 75 x 170 ft., brick, steel, parochial school, to D. O'Connell Sons, Inc., 480 Hampden St., Holyoke. Est. $150,000 or more. Noted May 8.

Mich., Grand Rapids—H. Morrel, mgr. Bd. Educ., 3 story, basement, 70 x 177 ft., brick, rein.-con. addition to Ottawa Hills High School, Iroquois Dr., to Lindh-Gustafson-Klopfer Co., 128 Crescent St. N. W., $165,117. Noted July 10.

N. Y., Alfred—Childs & Smith, archts., 720 North Michigan Ave., 3 story, 45 x 160 ft., dormitory to L. C. Whitford Co., Wellsville; heating and plumbing to M. G. Lippincott, Hornell, for Alfred University. Noted June 19.

O., Akron—Bd. Educ., I. M. Moses, clk., 1st unit 3 story, 70 x 282 ft., 46 x 88 ft., wing for boiler, brick, terra cotta North High School, Tallmadge Ave., to A. F. Wendling Co., Massillon, $326,363. Noted July 10.

O., Chillicothe—Garber & Woodward, archts., 4 West 7th St., Cincinnati, 3 story, basement, brick, steel, concrete high school to J. S. Hardyman, Maysville, Ky. for Bd. Educ. Est. $400,000. Noted May 29.

Pa., Aspinwall — Sunnyside Academy, Fox Chapel Rd., W. E. McKelvy, chn. Bd. Trustees, c/o McKelvy Hine Co., Columbia Bank Bldg., Pittsburgh, 3 story, basement boys dormitory, Fox Chapel Rd., to Golden & Crick Co., 3513 Fifth Ave., Pittsburgh. Est. $150,000. Noted June 26.

R. I., Cumberland (mail Manville)—School Bd., c/o J. Broderick, altering and constructing 3 story basement, 80 x 115 ft., brick, stone, steel addition, plain found., Broad St., to A. E. Smiley Constr. Co., Pawtucket. Est. $150,000 Noted July 24.

Tenn., Memphis—State Bd. Educ., Nashville, brick, stone science building at State Teachers College, to Hamilton & Begley Co., Memphis, $120,500. Noted July 3.

Tex., Corsicana — Bd. Educ., c/o Secretary, general contract Junior High School, 2 story, 136 x 262 ft., to Eckert-Burton Constr. Co., Burt Bldg., Dallas, $133,000.

Wis., Two Rivers—Bd. Educ., 2 story, basement, 89 x 162 ft. school to J. Rezash, est. $150,000.

Ont., Toronto—University of Toronto, Queens Park, general contract 2 story, basement, concrete, stone, addition to Hart House, men's athletic building, to Thomson Bros., 56 Grenville St.; steel, to Desher Steel Constr. Co., 80 Commissioner's St.; est. $150,000. Noted Feb. 20.

Ont., Windsor—Windsor-Walkerville Technical School Bd., 2 story, basement, 60 x 100 ft. addition to Technical School, to Ernest Clarke Ltd., 200 Banwell Ave., est. $200,000; heating, plumbing and ventilating, to C. E. Greenan, 211 Windsor Ave., $27,361.

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THEATRES

PROPOSED WORK

Calif., Burbank—Fox West Coast Theatres, Inc., Washington and Vermont Sts., sketches by Balch & Stabbery, Film Exch. Bldg., Los Angeles, 2 story, 1,200 seating capacity, rein.-con., concrete, stone, Burbank St. $200,000.

Calif., Los Angeles—Fox West Coast Theatres, Inc., Washington and Vermont Sts., plans by Balch & Stanbery, Film Exch. Bldg., 2 story, 2,000 seating capacity, rein.-con., incl. store, Melrose St. and La Brae Ave. $250,000.

Calif., Los Angeles — W. Fox, c/o W. Fox Studios, 1417 North Western Ave., plans by S. T. Norton & S. C. Lee, 1210 Financial Center Bldg., 2 story, 125 x 150 ft., 2,000 seating capacity, rein.-con., steel, Bway, south of 6th Ave. $400,000. Gumbiner Amusement Interprises, Inc., lessee.

BIDS ASKED

Calif., San Francisco — Miller & Pflueger, archts., 580 Market St., taking bids rein.-con., steel theatre, Ocean Ave., for S. Levin, c/o architects. $250,000.

N. J., Perth Amboy—J. Eberson, archt., 370 Lexington Ave., New York, bids about Sept. 15, general contract 2 story, basement, 105 x 260 ft., brick, steel, incl. stores, Smith and Maple Sts., for Warner Bros. Pictures, H. M. Warner, pres., 321 West 44th St., New York. $1,000,000. Noted July 10.

CONTRACTS AWARDED

Calif., Pomona—Fox West Coast Theatres, Washington and Vermont Sts., Los Angeles, 2 story, 105 x 190 ft., 20,000 seating capacity, rein.-con., tile, stone, marble, to Beller Constr. Co., 6513 Hollywood Blvd., Los Angeles, $171,-000. Noted June 26.

Calif., Santa Monica—H. A. Beldin & I. A. Marshall, 1 story, basement, 80 x 150 ft., rein.-con., terrazzo, 1,500 seating capacity, incl. 50 ft. stage Wilshire Blvd. and Euclid Ave., to J. M. Cooper Co., Inc., 321 Rives-Strong Bldg., Los Angeles, $150,000. Noted Jan. 9.

Pa., Rochester—J. M. DeAngelis, archt., 49 East Ave., Rochester, N. Y., 2 story, basement, 80 x 135 ft., 17 x 40 ft. wing, brick, hollow tile, steel, incl. office, store, to Rubenstein Constr. Co., Park Bldg., Pittsburgh. Est. $500,000. Noted June 24.

BANKS

PROPOSED WORK

Conn., Wallingford — Wallingford Bank & Trust Co., J. Martin, pres., sketches by Harper & West, 92 State St., Boston, Mass., remodeling 2 story bank, 28-34 Center St. $200,000.

N. J., Passaic—Halsey, McCormick & Helmar, 286 5th Ave., New York, soon lets general contract 8 story, basement, brick, steel, incl. office, Prospect St., Main and Howe Aves., for Peoples Bank & Trust Co., and Hobart Trust Co., 587 Main Ave. $350,000. Noted July 31.

BIDS ASKED

Calif., San Francisco—H. A. Minton, archt., Bank of Italy Bldg., taking bids 10 story, rein.-con., steel addition, incl. office, Clay and Montgomery Sts., for Bank of Italy, Bank of Italy Bldg. $200,000.

CONTRACTS AWARDED

Mo., Rolla—National Bank of Rolla, c/o Hotel Ozarks Co., Springfield, 4 story, basement, 100 x 150 ft., brick, concrete, rein.-con., stone bank and hotel to M. E. Gilliozz, Monett. $145,-000. Est. $150,000.

Va., Richmond — Federal Reserve Bank Co., addition, to R. A. Jones Constr. Co., Charlotte, N. C., $628,000. Noted June 19.

OFFICES

PROPOSED WORK

Minn., St. Paul—Minnesota Mining & Mfg. Co., Forest and Farquier Sts., plans by Toltz, King & Day, 1212 Builders Exch. Bldg., 1 story, basement, 58 x 176 ft. office and administration building, also addition to power plant, rein.-con., brick, Forest and Farquier Sts. $200,000.

N. J., Montclair—C. A. Corp., C. A. Fuller, pres., 550 Park St., Upper Montclair, office, stores, apartment, Church St. $150,000.

N. J., Paterson—Owner, c/o Goodman & Shulman, archts., 20 Smith St., sketches 10 story, basement, brick, steel, rein.-con., incl. stores, plain found., Bway, and Auburn Sts. $600,000.

Tex., Dallas—J. O. McReynolds & H. W. Brouse, Mercantile Bldg., plans by Flint & Broad, 402 Burt Bldg., Professional Tower, 25 story, brick, stone, steel, Live Oak and Harvard Sts. $2,000,000.

BIDS ASKED

Calif., San Francisco—See "Banks."

Mo., Kansas City—Aug. 8, by Kansas City Power & Light Co., 14th and Grand Sts., superstructure 30 story, basement, 100 x 131 ft. office building, 14th and Baltimore Sts. $2,500,-000. Holt, Price & Barnes, 2500 Telephone Bldg., archts. Noted Apr. 24.

N. J., Jersey City — Wahgold Realty, Inc., 22 Journal Sq., or J. T. Rowland, archt., 30 Journal Sq., bids about Sept. 15, general contract 12 story, basement, 75 x 75 ft., brick, steel, incl. stores, plain found., Hudson Co. Blvd. and Journal Sq. $250,000. Noted July 24.

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CONTRACTS AWARDED

Mass., Boston — Boston Financial Interests, c/o W. J. McDonald, 482 Beacon St., New England Building, 40 story, 3 basement, 207 x 471 ft., incl. bank, stores, and Professional Building, 20 story, Stuart St., to H. K. Ferguson Co., Hanna Bldg., Cleveland, O. Total est. $30,000,000.

N. Y., New York—Financial Dist. Realty Co., E. Cohen, pres., 206 Bway., 24 story office, bank, to Shroder & Koppel, 420 Lexington Ave. Est. $700,000. Noted July 31.

O., Columbus—W. M. James and Boyajohn & Bar Co., 299 South Park St., plans by Miller & Reeves, 203 East Broad St., 10 or 12 story Professional Office Building East Broad and 6th Sts. Owners build. Est. $2,000,000.

O., Van Wert—Childs & Smith, archts., 720 North Michigan Ave., Chicago, Ill., general contract 3 story, 54 x 200 ft., brick, stone, Main and Jefferson Sts., to Baker & Shindler, Defiance, for Central Mfgrs. Mutual Insurance Co. Total est. $300,000. Noted June 19.

STORES

PROPOSED WORK

N. J., Sea Bright—Mulford Eng. Co., Plaza Sq., sketches 1 story, basement, 100 x 100 ft. stores, motor boat showroom, Plaza Sq. $150,-000. Private plans.

BIDS ASKED

Ill., Chicago—Aug. 14, by A. S. Graven, Inc., 100 North LaSalle St., general contract 4 story, basement, 71x171 ft., brick, steel, stores, hotel, Wabash Ave. and 18th St. for B. F. Mayer, 304 South Dearborn St. $300,000.

N. J., East Orange—Starrett & Van Vleck, archts., 393 7th Ave., New York, taking bids general contract 4 story, basement, 100 x 100 ft., brick, steel, rein.-con., department store, plain found., Main and Prospect Sts., for R. H. Muir, 546 Main St., est. $150,000. Noted Mar. 6.

N. J., Jersey City—M. A. Wolf, archt., 845 Broad St., Newark, bids about Aug. 15, general contract 3 story, basement, brick, steel, incl. apartment, Manhattan and Terrace Aves., for A. Cordano, c/o architects. Noted June 17.

N. J., Lyndhurst—P. J. Jossier, archt., 240 Broad Ave., Palisades Park, bids about Sept. 2, general or separate contracts 2 story, basement, 90 x 100 ft., brick, steel, incl. apartments, for Owner, c/o architect. $150,000. Noted July 31.

N. J., Newark—Myers & Shanely, archts., 24 Walnut St., taking bids general contract 1 story, 60 x 190 ft., brick, steel addition, 657-59 Broad St., for W. W. Oppenheim, Inc., 657 Broad St. $150,000. F. W. Woolworth Co., 661 Broad St. Noted July 31.

CONTRACTS AWARDED

Calif., Los Angeles—S. Malsman, 2 story, 80 x 80 ft., terra cotta, marble, steel, Kingsley Dr. and Wilshire Blvd., to A. V. Perkinson Co., Inc., 3977 South Vermont Ave. $150,000.

Calif., Pasadena—S. H. Kress Co., 3 story, basement, 74 x 250 ft., rein.-con., terra cotta, tile, steel, iron, stone, terrazzo, to Clinton Constr. Co., Stock Exch. Bldg., Los Angeles, $213,400. Noted May 1.

Ind., Bloomington—J. C. Penny Co., general contract brick, steel, 115 College Ave., to P. M. Wilson Realty Co., 110 Citizens Loan Bldg. Est. $150,000.

Ont., Toronto—University Investments Ltd., c/o Gelber Bros., 205 Richmond St., general contract 2 to 4 story, basement, 104 x 110 ft., brick, stone, steel store and office, concrete found., College St. and Spadena Ave., to H. J. Hogerty, 78 Bexhill Ave. est. $175,000. Noted Feb. 27. Plumbing, to L. Schwartz, 391 Markham St.; marble, tile, terrazzo, to Italian Mosaic & Tile Co., 250 Madison Ave.

LOFTS

PROPOSED WORK

Ont., Toronto—Passchendalle Buildings Ltd., c/o J. B. Rogers, 325 Adelaide St., W., plans by Shepard & Calain, 36 Toronto St., 16 story, basement, concrete, stone loft and office building, Spadina Ave. and King St. $500,000.

PUBLIC

PROPOSED WORK

Calif., Los Angeles—JAIL—City plans by C. O. Brittain, supt. City Constr. Co., City Hall, 5 story, basement, 45 x 200 ft. and 45 x 110 ft. wing, rein.-con., Lincoln Heights. This corrects report in July 31 issue under "California."

Calif., Pasadena—AUDITORIUM—City plans by Bennett & Haskells, 311 1st Trust Bldg. and E. Bergstrom, 1136 Citizens Natl. Bank Bldg., Los Angeles, 3 story, 200 x 306 ft., rein.-con., brick, stone, stucco, art glass, cast stone, steel, Green St. and Garfield Ave. $1,050,000.

Kan., Alma — COURT HOUSE — Wabausee Co., 3 story, basement, brick, stone. $150,000. W. E. Glover, 301 Natl. Bank Bldg., Topeka, engr.

Mass., Cambridge—COURT HOUSE—Comrs. Middlesex Co., Court House, revised sketches by C. R. L. Greco, 11 Beacon St., Boston, 3 and 4 story, basement, brick, steel, stone, plain found., 3rd and Spring Sts. $200,000.

N. J., Hackensack—HALL of RECORDS—Bd. Freeholders Bergen Co., Court House, sketches by Tilton & Schwanewede, 420 Lexington Ave., New York, brick, steel, Main and Hudson Sts. $1,000,000.

N. J., Nutley—LIBRARY—Nutley Free Pub. Library, Park Dr., sketches by Armstrong & DeGelleke, 122 East 25th St., 2 story, basement, brick, steel addition, plain found., Park Dr. $150,000.

N. Y., Auburn—POLICE STATION—Bd. Fire & Police, soon takes bids police and fire station. $325,000.

Tex., Amarillo—COURT HOUSE—Potter Co., S. B. Motlow, judge, election Aug. 30, $420,000, 8 story, basement, 84 x 144 ft., stone, steel, rein.-con., plain found., 60,000 sq.ft. floor space. Townes, Lightfoot & Funk, Johnson Bldg., engrs. Noted July 10.

Ont., Toronto—POLICE ADMINISTRATION—City soon takes bids 3 story, stone, steel, concrete, concrete found., Fleet and York Sts., $250,000. J. J. Woolnough, City Hall, city archt. Noted June 5.

BIDS ASKED

Ind., Rockville — ASYLUM — Aug. 8, by Comrs. Parke Co., rein.-con. asylum, near here $150,000. C. O. Beeson, Crawfordsville, archt.

N. J., Maplewood (br. South Orange)—POLICE HEADQUARTERS — Police Dpt. E. Acculiarsius, ch. clk., Municipal Bldg., bids about Sept. 2, general contract 3 story, basement, brick, steel, police headquarters building, Dunnell Rd., $150,000. C. W. Grant, 175 5th Ave., New York, archt. Noted May 22.

Pa., Media—JAIL—Aug. 19, by Bd. Comrs. Delaware Co., 1, 2 and 3 story, basement, 200 x 600 ft., rein.-con., brick, steel, at Broad Meadow Farms. G. D. Adell, 1510 Chestnut St., Phila., archt.

CONTRACTS AWARDED

Conn., Middletown — DORMITORIES — Lone Lane Farm, Babcock St., three 2 story, brick, steel units, Lone Lane Farm, to Pieretti Bros., Centerbrook. $131,200. Noted July 17.

Md., Rockville—COURT HOUSE and JAIL—Comrs. Montgomery Co., B. C. Perry, pres., 4 story, basement, 80 x 170 ft., brick, hollow tile, steel, to J. J. McDevitt Co., Builders Bldg., Charlotte, N. C., $384,400. Noted Mar. 13.

N. J., Freehold—COURT HOUSE—Bd. Freeholders Monmouth Co., general contract altering and 3 story, basement, brick, steel, addition Court House, to Ehret & Day Co., Electric Bldg., Asbury Park, $308,691. Noted June 26.

N. D., Bismark—COURT HOUSE—Burleigh Co. general contract court house, jail, sheriffs residence to Redlinger & Hanson, 827 2nd Ave., South Minneapolis and Wahpeton, $197,000. Noted July 10.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Ill., Chicago—WORLD'S FAIR BUILDINGS—Chicago World's Fair, 1933, 160 North LaSalle St., plans electrical group, Worlds Fair Buildings, outer drive in Lake Front. $2,000,000. Private plans.

Mo., Ferguson — HOME — Mothers & Babies Home of Christian Church, soon takes bids, 2 story, basement, 100 x 250 ft., concrete, brick, Darst and Harnett Sts., Hoener, Baum & Froese, 3605 Laclede St., St. Louis, archts. Noted July 3.

N. J., Middletown—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Newark, plans by H. B. Brady, Inc., 333 North Broad St., Elizabeth, 2 story, basement, brick, plain found. $150,000. Noted July 17.

N. J., Newark—MAUSOLEUM—Roman Catholic Dioceses of Newark, J. A. Duffy, vicar general, Chancery Office, brick, steel, stone, plain found. $1,000,000.

N. Y., Maspeth—TERMINAL—H. C. Bohack Co., Flushing and Metropolitan Aves., Long Island City, sketches by Koch & Wagner, 32 Court St., Brooklyn, terminal, Newtown Creek. $2,000,000.

BIDS ASKED

Conn., Torrington — EXCHANGE — Southern New England Telephone Co., 157 Church St., New Haven, bids about Aug. 5, 2 story, basement, 90 x 100 ft., brick, rein.-con., steel telephone exchange. $150,000. R. W. Foote, 185 Church St., New Haven, archt. Noted July 3.

Ill., Chicago—RAILROAD STATION—Illinois Central R.R. Co., A. F. Blaess, ch. engr., 135 East 11th Pl., taking bids railroad station and 400 ft. viaduct. Randolph St. $1,300,000. Graham, Anderson, Probst & White, 80 East Jackson Blvd., archts. Noted Nov. 21, 1929.

N. J., Fort Lee—ADMINISTRATION—Consolidated Film Industries Inc., Lemoine Ave., taking bids general contract 2 story, basement, 60 x 120 ft. and 2 story, basement, 70 x 160 ft. administration and combined title department building, Lemoine Ave. $150,000. G. Dexter, 201 Main St., archt. Noted July 24.

N. J., Gladstone—ORPHANAGE—DePace & Juster, archts., 151 West 46th St., New York, bids about Sept. 15, general contract 2 story, basement, brick, steel, for Villa O'Connor Orphanage. $150,000. Noted July 31.

N. J., Paterson — HOME — Lee & Hewitt, archts., 152 Market St., bids about Sept. 2, general contract 2 story, basement, brick, steel addition, plain found., for St. Francis Home, 25 Jackson St. $150,000. Noted July 31.

N. Y., Pelham Manor—COMMUNITY HOUSE—Aug. 1, by Hugenot Memorial Church, and Allen & Collins, archts., 75 Newbury St., Boston, Mass., 2 story, basement, 115 x 140 ft., brick, Pelhamdale Ave. $150,000. Noted July 24.

Buildings Unclassified (Continued)

CONTRACTS AWARDED

Calif., Los Angeles—ACADEMY—Urban Military Academy, 637 North Wilcox Ave., brick, concrete, stucco, incl. administration, dormitory and service buildings, stable, etc., Beverly Blvd., to A. B. Weber, 311 Union Insurance Bldg., exceeds $150,000.

Calif., Los Angeles—LABORATORY—Craft Films, Inc., 2 story, 140 x 150 ft., steel, brick, Santa Monica Blvd., to H. A. Murphy, 6347 Eleanor Ave., $750,000, incl. equipment.

Calif., Los Angeles—LABORATORY—Hughes Development Co., 1001 North Orange Dr., 2 story, part basement, 150 x 297 ft., rein.-con., to Myers Bros., 3407 San Fernando Rd., $200,000. Noted July 24.

Minn., Minneapolis — GARAGE — Windom Block Realty Co., c/o Liebenberg & Kaplan, archts., 710 McKnight Bldg., general contract 2 story, basement, 155 x 158 ft., rein.-con., granite, bedford stone, cast iron, 13th St. and Harmon Pl., to E. M. Ganley Co., 2922 Oakland Ave. Est. $200,000. Holt Motor Co., 1301 Hennepin Ave., lessee.

Mo., St. Louis—MERCHANDISING MART—Terminal Railroad Association, 180 Market St. and St. Louis Mart, Inc., c/o H. C. Martin, 315 North 10th St., general contract wrecking buildings and excavating for 8 story, basement, 330 x 358 ft., rein.-con., brick, steel, stone, to The Excavating Co., 311 Central Natl. Bldg., total est. cost $5,000,000. Noted July 10.

N. J., Montclair—ART GALLERY—Montclair Art Museum, 3 South Mountain Ave., general contract 2 story, basement, brick, steel, stone addition, plain found., to Walter Kidde & Co., 140 Cedar St., New York. Est. $150,000.

N. Y., Newark—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., general contract 3 story, basement, 85 x 162 ft., brick, steel, plain found., to White Constr. Co., Inc., 95 Madison Ave., New York. Est. $300,000. Noted May 1.

Pa., Ambridge—LABORATORY—Spang Chalfant Co., Clark Bldg., Pittsburgh, 2 story, basement, 40 x 90 ft., brick, limestone, steel, Dana Ave., to Cuthbert Bros., Bessemer Bldg., Pittsburgh. Est. $150,000.

Alta., Edmonton — MAUSOLEUM — Canada Mausoleums, 907 McLeod Bldg., 1 story, 40 x 110 ft., rein.-con., stone, marble, bronze, 107th Ave. $150,000. Owner builds and sublets trades. W. Ralston, Canada Bldg., Windsor, archt.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ariz., Kingman—GAS PLANT—Owner, J. F. Langston, pres., c/o Commercial Gas Co. Ltd., Los Angeles, Calif., gas plant using Butane system of liquified petroleum. $50,000.

Calif., Los Angeles—FACTORY—Los Angeles Can Co., 3852 Union Pacific Ave., plans by Francisco & Jacobus, Pershing Square Bldg., 2 story, 180 x 220 ft., concrete, steel addition, Union Pacific Ave. $175,000.

Ill., Blue Island — MILK DISTRIBUTING PLANT—Roberts & Roberts, archts., 82 West Washington St., Chicago, soon lets contract 1 story, basement, plant on 78 x 344 ft. site, 40 x 70 ft. garage, and 74 x 76 ft. stable, brick, Vincennes Ave., for Bordens Farm Products Co., 326 West Madison St., Chicago. Est. $150,000. Noted June 5 under "Chicago."

Ind., St. Meinrad — PRINTING PLANT — Abbey Press plans by E. C Berendes, Evansville, 2 story, basement, 65 x 160 ft., brick, rein.-con. $75,000.

Ia., Sioux City—BAKERY—M. and L. Baking Co., 502 West 3rd St., sketches 2 story, basement, 50 x 150 ft. bakery, West 7th St. $100,000. Architect not selected.

Mass., Fall River—ICE PLANT—Service Co., M. St. Pierre, pres., 702 Pleasant St., ice plant. $50,000. Engineer not selected.

Mass., Watertown — FACTORY, etc. — New England Telephone & Telegraph Co., 245 State St., Boston, plans by Monks & Johnson, 99 Chauncy St., Boston, brick, steel factory, office and warehouse. To exceed $40,000.

Mass., West Springfield—PAPER PLANT—Strathmore Paper Co., Mittineague, plans by L. R. Howe, c/o owner, brick, timber. $125,000.

Mo., Kansas City—FACTORY—Phenix Box & Label Co., Wright-Smoke Bldg., plans by H. F. Brandenburger, 2500 Telephone Bldg., Kansas City, 1 story, basement, 100 x 168 ft., brick. To exceed $40,000.

N. J., East Rutherford — FACTORY — East Rutherford Syringe Co., 75 Mozart St., sketches by J. T. Camlet, 26 Piaget Ave., Clifton, 2 story, basement, brick, steel, plain found., Mozart St. $40,000.

N. J., East Rutherford — LABORATORY — Trubek Laboratories, soon lets contract 1 story, basement, 45 x 160 ft., brick, steel, plain found. $40,000. Private plans.

N. J., Rutherford—FACTORY—S. Cordo, 23 West Erie Ave., soon lets contract general contract 1 and 2 story basement addition, 23 West Erie Ave. $40,000. P. Pirrone, 104 Midland Ave., Garfield, archt. Noted July 24.

O., Marion—FACTORY—Marion Vault Mfg. Co., 1 story, brick, steel, concrete factory. $40,000. Private plans.

Okla., Chickasha — MILK PLANT — J. B. Nichols, sketches milk condensing plant. $100,000. Private plans.

Pa., Greenville—MANUFACTURING PLANT—Chamber of Commerce, c/o Pennsylvania Power Co., F. A. Conner, chn. Building Comm., soon takes bids 1 story, 60 x 150 ft., brick. Private plans. Adelet Mfg. Co., 4610 St. Clair Ave., Cleveland, O., lessee.

Pa., Pittsburgh—PLANT—Jones & Laughlin Steel Corp., Ross St., sketches improvements to plants here and at Aliquippa. $20,000,000.

Pa., Titusville — PLANT — Titusville Dairy Products Co., South Washington St., H. Rabild, pres. and mgr., plans by Braziell & Anderson, 209 4th Ave., Pittsburgh, concrete, brick, steel addition. **Maturity in fall.**

Tex., Higgins — COMPRESSOR STATION — Cities Service Gas Co., Bartlesville, 2,000 hp. natural gas compressor station, near here. $90,000. Private plans.

Tex., Sugar Land—FRUIT and VEGETABLE PACKING PLANT—State Prison Farm, c/o F. Tiller, secy., Rosenberg, 2 story, rein.-con., convict labor. $45,000. F. E. Giesecke, A. & M. College, College Station, archt. L. D. Royer, Smith-Young Tower, San Antonio, engr.

Ont., Guelph—GAS PLANT—City, Light & Heat Comrs., City Hall, plans steel, vertical coal gas retort, in connection with gas plant, concrete found. $150,000. N. S. Nicklin, City Hall, engr.

Ont., Kitchener — PLANT — Kiss Beverages Ltd., 126 West Ahrens St., plans by W. H. E. Schmalz, 129 King St. W., 2 or 3 story, basement, concrete, brick, steel. $100,000.

Ont., Toronto—PRINTING PLANT—Stainton & Ellis Ltd., 232 Bay St., plans by G. M. Miller & Co., 71 Mutual St., 6 story, brick, steel, incl. office, concrete found. $150,000.

BIDS ASKED

N. J., Jersey City—ICE PLANT—Mongiello Bros., 625 Communipaw Ave., taking preliminary bids general contract 1 story, basement, 100 x 100 ft. ice plant, $40,000. C. H. Ziegler, 26 Journal Sq., archt. Noted June 19.

N. J., Union City — DAIRY — G. Willaredt, archt., 411 23rd St., West New York, bids about Sept. 2, altering and constructing 2 story, basement, 28 x 155 ft., brick, steel addition, 45th St. and New York Ave., for Consumers Dairy Co., 400 45th St. Est. $45,000. Noted July 31.

N. Y., Buffalo—INDUSTRIAL—International Milling Co., 120 Childs St., bids about Aug. 10, 100 storage binds, 150 ft. high. $350,000. W. J. Gordon, Minneapolis, Minn., engr.

Pa., Ambridge—ICE PLANT—Briola Bros., 10th Ave., taking bids on revised plans 1 story, brick, tile, 10th and Glenwood Sts. $60,000 incl. machinery. Private plans.

Tex., Harlingen — CLOTHING FACTORY — Temple Mfg. Co., taking bids 2 story, rein.-con., brick, incl. electrically-operated machines, plain found. $100,000. Private plans.

Tex., Sugar Land—FRUIT and VEGETABLE PACKING PLANT—See "Contracts Awarded."

Tex., Thrall — REFINERY — See "Contracts Awarded."

Tex., Weslaco — PACKING PLANT — See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Livermore—ROCK, SAND and GRAVEL LOADING PLANT—L. H. Nishkian, engr., 525 Market St., San Francisco, rein.-con. washing, screening, loading plant, to Schuler & McDonald, 1723 Webster St., Oakland, $37,669. Noted July 24.

Calif., Richmond—ASSEMBLYING PLANT—Ford Motor Co., Dearborn, Mich., general contract 320 x 950 ft. assembling plant 400 cars per day capacity, with 160 x 950 ft. 2nd story portion, 55 x 80 ft. boiler plant, 62 x 113 ft. oil house, 400 ft. craneway, 100 ft. wide, to Clintoh Constr. Co., 923 Folsom St., San Francisco, $3,500,000. Noted Feb. 20.

Calif., Watsonville—COLD STORAGE PLANT—Gay Eng. Corp., engrs., 2650 Sante Fe Ave., Los Angeles, 75 x 110 ft., rein.-con., to P. T. Walstrom, 30 West Lake Ave., $49,950. Noted July 24.

Conn., Bridgeport — FACTORY — Heppenstall Forge Co., 95 Howard Ave., brick unit, Howard Ave., to Hewlett Co., 886 Main St. Est. $40,000.

Conn., Fairfield — FACTORY — McKesson & Robbins, rein.-con., brick, to T. J. Pardy Constr. Co., 1481 Seaview Ave., Bridgeport. Est. $50,000. Noted July 31.

Conn., Norwalk—ICE PLANT—Hain Bros., Meadow St., 1 story, 55 x 150 ft., brick, concrete, Meadow St., to T. Lanese, 190 Calhoun Ave., Bridgeport. Est. $40,000. Noted Apr. 17.

Ind., Greensburg — FACTORY — Standard Casket Co., general contract brick, steel, North Anderson St., to W. A. Gutzwiller, Batesville. Est. $40,000.

Ind., South Bend—DAIRY PLANT—Willida Dairy Co., general contract 1 story, 64x208 ft., rein.-con., brick, to R. Sollitt, 518 East Sample St. Est. $45,000. Noted July 24.

Md., St. Helena (mail Baltimore)—FACTORY—Chemical & Pigments Corp., two 1 and 2 story, 50 x 110 ft., steel factory, to Price Constr. Co., Maryland Trust Bldg., Baltimore.

Mass., Everett—MURIATIC ACID PLANT—Merrimac Chemical Co., Chemical Lane, brick, steel, to P. J. Macnaughton Co. Inc., 711 Boylston St., Boston.

Mass., Everett—PLANT—New England Fuel & Transportation Co., 250 Stuart St., Boston, 2 story, concrete bensol plant, concrete found., Rover St., to Koppers Constr. Co., Koppers Bldg., Pittsburgh, Pa. To exceed $40,000. Noted July 31.

Minn., St. Paul — PUBLISHING PLANT — M. J. O'Neil, 607 New York Bldg., general contract 3 story, basement, rein.-con., brick, University Ave. and Berry St., to C. Skooglum, 502 Ryan Bldg. Est. $100,000. Bruce Publishing Co., 2420 University Ave., lessee.

Miss., Laurel — FACTORY — C. P. Limbert Furniture Co., Holland, Mich., sublet general contract 1 story, concrete, brick, 100 x 1,000 ft., L shaped, to Arch Constr. Co., New Orleans, La. Est. $175,000.

Miss., Meridian — MILK PASTEURIZING PLANT — Lauderdale Dairies, Inc., M. G. Ness, mgr., 1 story, 90 x 90 ft. and 15 x 16 ft., brick, hollow tile, 27th Ave. near 5th St., to L. B. Priester & Son, 1403 12th St.; mill work, to Acme Building & Supply Co., Meridian; structural steel, to Mobile Steel Co., Mobile Ala.; roofing, to J. Owens, Meridian; tile, to Carmichael Tile Co., 24th Ave. and S St.; steel sash, to Melton Hardware Co., Meridian. Est. $40,000.

N. J., Belleville (br. Newark)—FACTORY—Fletcher-Thompson, Inc., archts., 31 Fulton St., Newark, general contract 4 story, basement, 78 x 170 ft., brick, steel addition, to Mahoney Troast Co., 857 Main Ave., Passaic, for Wallace & Tierman Co., Inc., 11 Mill St. Est. $150,000. Noted July 10.

N. J., Bound Brook—FACTORY—Francisco & Jacobus, engrs., 511 5th Ave., New York, 1, 2, 3 story, 405 x 410 ft. main building, 1 and 2 story, 100 x 200 ft. manufacturing building, 100 x 100 ft. machine shop, 1 and 2 story, manufacturing building No. 2, 50 x 100 ft. power house, storage building, pump house, switch house, gatehouse, scale house, car shed to Karno-Smith Co., Inc., Broad Street Bank Bldg., Trenton, for Bakelite Corp., 247 Park Ave., New York. Est. $150,000. Noted July 10.

N. J., Linden—FACTORY—Standard Oil Co. of New Jersey, Brunswick Ave., general contract 2 story, 125 x 185 ft., brick, steel, rein.-con., plain found., to Austin Co., 120 Bway., New York. Est. $200,000.

N. Y., Cortland—FACTORY—Brewer-Titchenor Corp., general contract 1 story, brick, steel, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $100,000.

N. Y., Leroy — FACTORY — Lapp Insulator Co., 1 story, brick, steel, to H. K. Ferguson Co., Hanna Bldg., Cleveland, O. Est. $40,000.

N. Y., New York — MILK DISTRIBUTION PLANT — Sheffield Farms, Inc., 524 West 57th St., general contract 125 x 150 ft. milk distribution plant, to White Constr. Co., 95 Madison Ave. Est. $200,000. Noted July 3.

O., Cleveland — STEEL MILL — American Steel & Wire Co., J. S. Keefe, pres., Rockefeller Bldg., masonry contract for 1 story, 80 x 700 ft., brick, steel addition, East 42nd and Harvard Sts., to Stevens Constr. Co., Erie Bldg. Total est. $150,000.

O., Cleveland—FACTORY—Valuation Service Co., c/o Guardian Trust Co., 623 Euclid Ave., altering 2 story, basement, brick, steel, concrete, 7275 Wentworth Ave., to George L. Craig, Inc., 4614 Prospect Ave. Est. $50,000.

O., Geneva—FACTORY—American Fork & Hoe Co., G. B. Durrell, pres., B. F. Keith Bldg., Cleveland, 2 story, 53 x 251 ft., brick, steel, to Rice-Jones Co., Union Bldg., Cleveland. Est. $75,000.

O., Willoughby—FACTORY—Ohio Rubber Co., 1 story, 120 x 480 ft., brick, steel addition to Building C, to H. K. Ferguson Co., Hanna Bldg., Cleveland, $100,000. Est. $600,000 incl. equipment. Noted July 31.

Pa., Altoona—BAKERY—Westmont Bakery, W. Fechter, in charge, 2918 Spruce St., 2 story, basement, 45 x 47 ft., brick, steel, incl. office, storage, locker rooms, 2918 Spruce St., to Reppert Constr. Co., 1105 13th St. Est. $40,000.

Pa., Erie—FINISHING ROOM—Hammermill Paper Co., E. R. Bahrend, pres., East Lake Rd., 1 story, 20 x 90 ft., steel, tile, East Lake Rd., to H. Platt Co., 1006 Palace Hardware Bldg. Est. $62,000.

Pa., Phila.—MANUFACTURING PLANT—Bollinger Co., archts., 12th and Chestnut Sts., 2 and 3 story, basement, 117 x 305 ft., rein.-con., brick, steel, to Wark Co., 1608 Walnut St., for Becker Smith & Page, Water and Snyder Sts. Noted July 3.

Pa., Pittsburgh—PLANT—A. L. Babberman, treas. Pennsylvania Drilling Co., 1812 Carson St., 2 story, 50 x 100 ft., brick, steel, 1201-03 Chartiers St., to F. J. Busse, 112 Wabash Ave. Steel deck roof construction.

Pa., Phila.—BAKERY—Butterkake Co., 1034 South 57th St., general contract 1 story, basement, 50x250 ft., brick, steel, bakery, to Farrell Roth Co., 21 South 46th St.

Pa., Pittsburgh—DAIRY—McCormick Co., Inc., archts., 121 South Negley Ave., 3 story, 120x130 ft., rein.-con., dairy to H. Busse Co., 112 Wabash Ave., for Isaly Dairy Co., 1033 Mahoning Ave., Youngstown, O., est. $200,000.

Tenn., Chattanooga — PLANT—Chattanooga Coco Cola Bottling Co., 214 Forest St., 2 story, basement, 82 x 119 ft., brick, stone, tile, to M. K. Wilson, Power Bldg., $150,000. Noted Feb. 27.

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Factories and Mills (Continued)

Tex., Thrall—REFINERY—Roy Westbrook & Associates, Thrall, and Electric Bldg., Fort Worth, 3,000 bbl. refinery, incl. skimming unit, special process for extracting fuel oil from crude oil, mostly by day labor. $125,000.

Tex., Weslaco — PACKING PLANT — L. E. Snavely, 2 story, 80 x 120 ft. vegetable and citrus packing plant, rein.-con., brick, day labor. $35,000. Private plans.

Ont., New Toronto — PLANT — Anaconda American Brass Ltd., 1 story 70 x 450 ft. and 1 story, 98 x 100 ft., brick, steel, stucco additions, concrete founds. by day labor. $200,000. Structural steel to Reed & Brown Structural Steel & Iron Wks., Fleet St., Toronto; steel sash to A. B. Ormsby Co., 172 Van Horne St., Toronto.

Ont., Sault Ste Marie—MILL—Algoma Steel Corp. Ltd., 503 Queen St. E., structural steel for 1 story, concrete, brick, steel rail mill, to Hamilton Bridge Co. Ltd., Bay St. N., Hamilton; steel traveling crane, to Dominion Bridge Co. Ltd., Lachine, Que. Total est. $1,250,000.

Ont., Toronto—PLANT—Canada Falls Ltd., 7 Fraser Ave., 100 x 100 ft., brick, steel addition, to Thompson Bros. Ltd., 56 Grenville St. Est. $75,000.

Ont., Toronto—CONFECTIONERY PLANT—Jenny Lind Candy Co. Ltd., 1011-12 Star Bldg., general contract 5 story, basement, 53 x 112 ft. rein.-con., to Sullivan & Fried, 81 Victoria St., est. $85,000.

GARAGES

PROPOSED WORK

Calif., Los Angeles—See "Warehouses."

Ia., Sioux City — Sanford Brothers & Co., Frances Bldg., soon takes bids 2 story, basement bus terminal depot 5th and Douglas Sts. $125,000. Buettler-Arnold, Insurance Exch. Bldg., Sioux City, archts. Interstate Transit Lines, 222 West Madison St., Chicago, Ill., lessee.

Mass., Boston—Jameson Bros., 30 Lawrence St., plans by J. F. Cullen, 162 Newbury St., 1 story, 80 x 150 ft., rein.-con., brick, steel service and repair garage, Lawrence St. $60,000.

Mass., Cambridge—American Oil Co. of Massachusetts, 465 Rindge Ave. plans 1 story, basement, irregular sized, brick, rein.-con., steel garage and super service station, 104 Mt. Auburn St., $60,000. Fay, Spofford & Thorndike, 44 School St., Boston, engrs.

Mass., Somerville — City, Mayors Office, City Hall, concrete, steel garage, City Rd. To exceed $40,000. Architect not selected.

Minn., Duluth—Wahl Candy Co., T. W. Wahl, West 2nd St., soon takes bids, 2 story, 100 x 140 ft., brick, terra cotta garage, $50,000. J. J. Wangenstein, 310 Palladio Bldg., archt.

Pa., Greenville—Sterling Oil Co., Emlenton, soon takes bids brick greasing and washing service station, Penn and Main Sts. $40,000. Private plans.

BIDS ASKED

Ia., Charles City—Aug. 14, at office Auditor Floyd Co., 34 x 146 ft. hollow tile maintenance garage, shop. J. S. Dawson, Charles City, co. engr.

N. J., Elizabeth—See "Contracts Awarded."

N. J., Montclair—A. E. Ramhurst, archt., 516 Bloomfield Ave., taking bids general contract 2 story, basement, 100x165 ft., brick, steel, garage and salesroom, Glenridge and Grove Sts. for Lloyd White, c/o archt. Noted Aug. 7.

N. J., Newark—Elin Auto Supply Co., 273 Halsey St., bids about Aug. 15, general contract 1 story, basement, 45 x 110 ft. and 2 story, basement, 45 x 180 ft., brick, steel, terra cotta auto laundry plant and service station, William St., between Washington and Halsey Sts. $40,000. A. Goldberg, 164 Montague St., Brooklyn, archt.

CONTRACTS AWARDED

Conn., New Haven—Continental Baking Co., 140 Canal St., 1 and 2 story, 60 x 150 ft., brick, steel garage and service building, Canal St., to Kelly & Wood, 149 Temple St. Est. $40,000.

Ind., Indianapolis—Lincoln Oil Co., general contract brick, steel super-service station, Kessler Blvd. and Lafayette Rd., to A. V. Stackhouse, 2611 Cornell Ave. Est. $46,000.

Ind., South Bend—Texas Co., brick, steel service station, shop, 1112 South Mich. St. $41,200. Owner builds.

Mass., Brockton—Brockton Tire & Rubber Co., 141 Brookline Ave., Boston, 2 story, brick, concrete tire service station, High, Warren and Lincoln Sts., to Allen & Gillis, 313 Washington St., Newton. Est. $40,000.

Mass., Brookline (br. Boston) — SUPER-SERVICE STATION—Shell Eastern Petroleum Products, Inc., 141 Milk St., Boston, concrete, Harvard St., to Simpson Bros. Corp., 77 Summer St., Boston.

N. J., Elizabeth — Pub. Serv. Co-Ordinated Transport Co., 80 Park Pl., Newark, 1 story, basement, 100 x 240 ft., brick, steel addition, Division and Livingston Sts., separate contracts, $150,000. Private plans.

R. I., Newport—C. B. Lawton and A. J. King, Marlboro St., 1 story, irregular sized, brick, rein.-con., steel service garage, repair shop, concrete found., to T. F. Keecher, Waites Wharf. Est. $50,000. Noted Jan. 16.

Ont., Ottawa — Larcmount Motor Sales Co. Ltd., 2 story, basement garage and show rooms, Bank St., to H. K. Ferguson, 77 Wellesley St., Toronto, $45,000.

SHOPS AND FOUNDRIES

PROPOSED WORK

Pa., Pittsburgh—MACHINE SHOP, etc.—E. B. Lee archt., Chamber of Commerce Bldg., soon takes bids general contract 45 x 128 ft., machine shop, 27 x 60 ft. bath house, 50 x 80 ft. office building, all 1 story, brick, steel, at eastern end Neville Island, for Gulf Refining Co., Frick Building Annex, Pittsburgh, and 21 State St., New York. $1,500,000.

BIDS ASKED

N. J., Fort Lee—MACHINE SHOP and SHIPPING DEPARTMENT—Consolidated Film Industries, Inc., Lemoine Ave., taking bids 1 story, basement, 25 x 240 ft., and 1 story, basement, 20 x 200 ft., brick, steel, Lemoine Ave. $75,000. Noted July 24.

N. J., Maplewood—L. R. Schenck, 513 Valley St., taking bids general contract 2 story, basement, brick, steel, shop and garage, Valley St., $40,000. R. B. Flatt, 600 Bloomfield Ave., Bloomfield, archt.

N. J., Newark—AUTO RADIATOR and GARAGE—M. A. Wolf, archt., 845 Broad St., taking bids general contract 2 story, basement, auto radiator shop, 268-74 Central Ave., for J. Black, 246 Central Ave. $50,000. Noted Apr. 10.

CONTRACTS AWARDED

N. J., Highbridge — FOUNDRY — Taylor-Wharton Iron & Steel Co., general contract 1 story, brick, steel, extension, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $300,000.

POWER PLANTS

PROPOSED WORK

Ariz., Ft. Huachuca—Arizona Imperial Mines Co. 1,500 hp. power house, 200 ton flotation plant, new compressor and hoist. Max R. V. Baumkirchner, pres.

Kan., Kansas City — City soon takes bids power and light plant improvements. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Mass., East Long Meadow — Central Massachusetts Electric Co., Palmer, 1 story, brick, steel, concrete automatic power sub-station. $50,000. Private plans.

Minn., Duluth—Duluth Steam Corp., J. J. Dwyer, genl. mgr., plans by W. J. Sullivan, 408 Palladio Bldg., 8 story, basement steam heating plant. $1,250,000.

Mo., Caruthersville—City, preliminary surveys municipal light and power plant, incl. rein.-con., brick building, generating equipment, complete distribution system. $225,000. Russell & Axon, 6200 Easton Ave., St. Louis, and McDaniel Bldg., Springfield, engrs.

Mo., Hayti—City sketches power plant, generating equipment, distribution system. $80,000. Russell & Axon, 6200 Easton Ave., St. Louis, and McDaniel Bldg., Springfield, engrs.

Tex., Huntsville — State Penitentiary System soon takes bids remodeling power plant, sanitary equipment. $75,000. L. B. Royer, Smith Young Tower, San Antonio, engr.

Tex., Huntsville — State Penitentiary System soon takes bids remodeling power plant, sanitary equipment. $75,000. L. B. Royer, Smith Young Tower, San Antonio, engr.

Tex., Richland Springs—See "Unclassified."

Tex., Sugar Land — State Prison Comm., F. Tiller, secy., Rosenberg, sketches by F. E. Giesecke, A. & M. College, College Station, 2 story power plant, incl. laundry, lighting, Imperial State Prison Farm. $25,000. L. D. Royer, Smith-Young Tower, San Antonio, engr.

BIDS ASKED

Calif., San Francisco — See "Contracts Awarded."

Mass., Everett—See "Contracts Awarded."

Mass., Lawrence—See "Contracts Awarded."

N. J., Passaic—See "Contracts Awarded."

S. D. Pierre — Aug. 15, by R. Baker, city auditor, addition to power house, 2 engines, etc. at Municipal Power plant. $125,000. Noted July 31.

Vt., Charleston (mail Derby Line)—Village of Barton, c/o A. Cutting, taking bids altering and constructing 1 story, brick addition to municipal light and power plant. $40,000. I. W. Jones & Co., Milton, N. H., engrs. Noted July 31.

Ont., St. Catharines — Aug. 18, by J. W. Pugsley, secy. Dpt. Railways & Canals, Parliament Bldgs., Ottawa, surge tank, penstock breeching and connections in connection with hydro-electric plant for Welland Ship Canal. $25,000. A. E. Dubuc, Dpt. Railways & Canals, Parliament Bldgs., Ottawa, ch. engr.

CONTRACTS AWARDED

Calif., San Francisco—Pacific Gas & Electric Co., 245 Market St., 3 story, steel, concrete substation, 19th and San Carlos Sts., day labor. $85,000.

Mass., Everett—Mystic Iron Wks., 250 Stuart St., Boston, altering and constructing 1 story, brick, steel addition, concrete pile found., Dexter St., separate contracts. $40,000. Private plans.

Mass., Lawrence — Meadow Brook Laundry Co., 17 North Methuen St., 1 story, rein.-con., brick, steel power house, North Methuen St., separate contracts. $40,000, incl. equipment. H. Petzold, Bay State Bldg., archt. Noted July 10.

Ind., Hammond—Graham, Anderson, Probst & White, archts., 80 East Jackson Blvd., Chicago, Ill., general contract 194 x 380 ft. addition to generating plant, 32 ft. high, to Herlihy-Mid-Continent Constr. Co., 228 North La Salle St., Chicago, Ill.; structural steel, to McClintic-Marshall Co., 28 South Dearborn St., Chicago, Ill. Noted June 10.

Ind., South Bend—Ind. & Mich. Electric Co., general contract 40 x 60 ft., brick, steel power sub-station, Colfax and Kaley Sts., to John Nelson Co., 712 North Niles St. Est. $43,000.

Ia., Charles City—Iowa Pub. Serv. Co., c/o G. V. Lonnecker, superv. engr., Commercial and West Park Aves., 1 story, basement 49 x 65 ft. rein.-con., brick, steel boiler plant addition, to Currie Constr. Co., 180 West 1st St., Waterloo, $40,000.

Mo., St. Louis—Bd. Educ., 911 Locust Ave., general contract 1 story, basement, 70 x 150 ft. rein.-con., brick, stone, power house on School St., to Dunham Constr. Co., Chemical Bldg., $104,000—boiler, breeching and brickwork to Union Iron Wks., Chemical Bldg., $38,837—conveyor equipment to Link-Belt Co., 3638 Olive St., $10,767—piping and auxiliaries to Amer. Power Piping Co., Merchants Laclede Bldg., $61,814—gage board and instruments to Eichler Heating Co., Railway Exchange Bldg., $5,907—4-valve engine to Elliott Co., Railway Exchange Bldg., $17,250—Diesel engine to Fulton Iron Wks. Co., 1259 Delaware Ave., $17,397—generator and exciter and switchboards M. G. sets to Westinghouse Electric & Mfg. Co., 411 North 7th St., $9,760 and $13,865 respectively — electrical wiring to S. C. Sachs, Inc., 1422 Olive St., $30,900. Grand total $309,497. Noted June 26.

N. J., Passaic—Pub. Serv. Electric & Gas Co., 80 Park Pl., Newark, altering 1 story electrical switching station, Columbia Ave., separate contracts. $40,000. Private plans.

Pa., Oil City—Oil City Boiler Wks., F. Ande, purch. agt., 351 Seneca St., boiler plant, 351 Seneca St., to L. O. Bouquin Co., 13 East 1st St. Est. $40,000.

Ont., Hamilton — Algoma Steel Corp., one 5,000 hp. single armature reversing type mill motor, 50 to 120 r.p.m.; two 2,000 kw. 700 volt 507 r.p.m. direct current generators mounted on same bed plate with 72,000 lb. steel plate flywheel, 4,250 hp. induction motor, 3 phase, 6,600 volts, 60 cycles; 5 unit exciter set driven by 150 hp. motor, 2 air conditioning and ventilating sets, 2 circulating oiling systems and complete control equipment, to Canadian Westinghouse Co., Hamilton, $250,000.

Ont., Toronto—Toronto Electric Comrs., 225 Yonge St., altering and constructing concrete, steel, brick, stone substation, Ruskin and Edwin Sts., to A. W. Holmes, 6 Hayden St. Est. $50,000. Equipment will be purchased by owners.

WAREHOUSES

PROPOSED WORK

Calif., Los Angeles — Robinson Fireproof Building Co., Inc., plans by Dodd & Richards, 606 Architects Bldg., 4 story, 67 x 93 x 230 ft., rein.-con., incl. garage, 8th Pl. from Francisco to Corydon Sts. $150,000.

Mass., Brockton—Taunton Lumber Co., 243 North Montello St., warehouse, 291 North Montello St. $50,000. Engineer not selected.

Mass., Wayland — Wayland Motors Co., A. McManus, State Rd., plans by Rosenblatt Bros., 120 Concord St., Framingham, 1 story, 100 x 150 ft. storage and warehouse, concrete found., State Rd. To exceed $40,000.

N. J., Clifton—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, plans 2 story, basement, brick, steel, freight house, Lakeview Sect. $150,000.

O., Cleveland—Baltimore & Ohio R.R. Co., H. A. Lane, ch. engr., Baltimore, Md., 6 or 8 story, brick, concrete, steel terminal warehouse, 6 Canal Rd. $2,000,000.

Tenn., Memphis—Patterson Transfer Co., 24 North 2nd St., R. E. Galloway, pres., 2 story, 190 x 280 ft., brick, steel, incl. office 100,000 sq.ft. floor space, Georgia St., $140,000. W. F. Schulz, Shrine Bldg., engr.

Ont., Fort William—Canadian Natl. Rys., New Union Sta., Toronto. T. T. Irving ch. engr., rebuilding freight sheds destroyed by fire. $1,000,000 loss.

CONTRACTS AWARDED

N. J., Camden—Sibley & Son, Inc., 6th and Chelton Sts., 2 story, basement, 117 x 162 ft., brick, Bulson and 6th Sts., to J. S. Rogers Co., Drexel Bldg., Phila., Pa.

Va., Richmond—Richmond, Fredericksburg & Potomac R.R. Co., Richmond, E. M. Hastings, ch. engr., warehouse on Duncan and Clay Sts., to Doyle & Russell, 1106 East Cary St. Est. $75,000.

Va., Richmond—Virginia Electric & Power Co., 700 East Franklin St., 3 story, concrete storage plant, Grayland Ave., to J. T. Wilson Co., Inc., Mutual Bldg. Est. $126,500.

Vt., White River Junction—Central Vermont R.R. Co., Inc., P. D. Fitzpatrick, ch. engr., St. Albans, subsidiary of Canadian National Rys., 1 story, brick, steel, concrete freight warehouse. To exceed $40,000. Owner builds. Noted June 26.

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See proposal advertising on page 140